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Keys to the Flora of Florida -- 7, Campanulaceae ¹

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ABSTRACT: A key is provided to the 5 genera of Campanulaceae (incl. Lobelioideae) native and naturalized in the state of Florida. The genera, with the number of included species, are: *Campanula*, 3; *Lobelia*, 12; *Sphenoclea*, 1; *Triodanis* (= *Specularia*), 2; and *Wahlenbergia*, 2. Amplified keys are presented to the species within each genus. The keys are supplemented with discussion of nomenclature and justification of generic placement and specific delimitation. *Sphenoclea zeylanica* and *Wahlenbergia linarioides* are newly reported for Florida. *Lobelia cliffortiana*, *L. elongata*, and *Hippobroma longifolia* are excluded.

CAMPANULACEAE Juss.

Bellflower Family

This well-defined family is represented in Florida by 5 genera, 2 of which (*Sphenoclea* and *Wahlenbergia*) are of recent introduction and were unknown for the state in the writings of J. K. Small. Of the 20 species, 4 (or 20%) are endemic and 17 (or 85%) are native. One species (*Campanula robinsiae*) is now perhaps extinct.

The Campanulaceae is at present generally circumscribed so as to contain Lobeliaceae R. Br. (as subfamily Lobelioideae), but the separation recognized by Small and other earlier authors still finds modern adherents (cf. J. Hutchinson, Families of Flowering Plants 1:476-477. 1959).

1. Corolla zygomorphic, longitudinally parted along the upper side; anthers cohering into a tube around the style.

Lobelia

1. Corolla actinomorphic, the lobes uniformly connate; anthers free from each other.

2. Flowers small, white-petaled, closely compacted in a terminal spike.

Sphenoclea

2. Flowers conspicuous, blue or purple, solitary and terminal or in loose racemose or spicate inflorescences.

¹ This paper is Florida Agricultural Experiment Station Journal Series No. 964.

3. Each flower sessile in the axil of a floral bract approximating a leaf in size and shape; some flowers cleistogamous.
Triodanis
3. Each flower pedicellate or subtended by a reduced bract; all flowers chasmogamous.
4. Corolla rotate; capsule opening by 3 apertures on side of the hypanthium.
Campanula
4. Corolla funnelform to narrowly campanulate; capsule opening by 2 - 3 apical valves, above the sepals.
Wahlenbergia

CAMPANULA

A brief but modern conspectus of North American *Campanula* has been presented by S. G. Shetler (Rhodora 65:319-337. 1963). The one northern species found locally in the Panhandle (*C. americana*), and the one species widely endemic in the Peninsula (*C. floridana*), are well known and are unquestioned native members of Florida's flora.

The status of the third Florida species, *Campanula robinsiae*, is much less certain. It is known from very few collections, and has perhaps been seen in the field by only a single living botanist (R. Kral, the actual collector of *G. R. Cooley* 6029, 26 Apr 1958, USF). It has been treated as an endemic occupying a single Florida hillside, but the probability seems at least equally great that it is a recent introduction.

Campanula robinsiae was described by J. K. Small (Torreya 26: 35-36. 1926) from a collection made in the spring of 1924 on Chinsegut Hill, a rounded prominence 4 miles north of Brooksville, Hernando County. The plant is similar to *C. reverchonii*, a granitic soil endemic of the Edwards Plateau of Texas, a relationship that was noted both by Small and by Shetler. It is not closely related to *C. floridana* or other Southeast species. Its presence on one of the highest Florida hills has supported the assumption that its survival was associated with the marine inundations of the Pleistocene interglacials. Since certain other Florida endemics are seen as having persisted on a peninsular refugium or "Orange Island" (R. E. Woodson, Cont. Gray Herb. 165:12-25. 1947; W. T. Neill, Bull. Fla. State Museum 2:175-220. 1957; *contra*, C. W. James, Brittonia 13:225-244. 1961), the supposition was a natural one that *C. robinsiae* had a similar origin and history.

Even so, botanists who were familiar with Chinsegut Hill and the stately residential structure and associated landscaping placed on its summit and slopes by Mr. and Mrs. Raymond Robins were wary

of full acceptance of *Campanula robinsiae* as a Florida endemic. R. M. Harper (Jour. Fla. Acad. Sci. 12:14. 1949) remarked: "It would be very strange if a genuine native plant was confined to a single hill which was already considerably modified by civilization." Shetler (1963), after an unsuccessful search of Chinsegut Hill, wrote: "...the possibility must not be ruled out that *Campanula robinsiae* represents a pre-1926 Eurasian introduction, perhaps accidental."

Several independent observations may be presented in support of this cautious view. First, Chinsegut Hill is not part of the Lake Wales Ridge of central peninsular Florida upon and around which so many of the Florida endemics reside. It is a northern outlier of the Brooksville Ridge, a series of hills of nearly similar elevation but very different biology. Neither animals (Neill, loc. cit.) nor plants give clear evidence of Pleistocene survival in the Brooksville area. Within the flowering plants only *Justicia cooley* Monachino & Leonard and *Clematis micrantha* Small have been represented as endemics, the latter probably of less than specific importance (C. S. Keener, Sida 6:37. 1975), and both are at relatively low elevations which suggests a different biogeographic history.

Second, the topography of the Brooksville Ridge is conspicuously different from that of parts of the Lake Wales Ridge. Chinsegut Hill is a smoothly rounded mound, as are the other conspicuous elevations in the Brooksville area. It is difficult to imagine these promontories retaining any appreciable environmental diversity during interglacial marine intrusions. In contrast, significant areas of the Lake Wales Ridge are fundamentally level but cratered with innumerable depressions which would have retained a mesic non-saline vegetational cover.

Third, Chinsegut Hill, with an elevation of 274 feet, is significantly lower than was supposed by Small (1926), who noted it to be "reported as 366 feet altitude," and by others who have attributed endemic survival to the presence of a few emergent sea mounts throughout the Pleistocene. Even so, it is exceeded in peninsular Florida only by Iron Mountain in the Lake Wales Ridge, at 295 feet. But elevations above 250 feet are very limited in the Peninsula, and even those above 200 feet are scarcely large enough to visualize as Pleistocene refugia. Lower elevations must also have been available. Each lower elevation implies, of course, a still shorter period of continuous availability, for the earlier interglacials generated more severe flooding than did the more recent ones.

And fourth, the coupling of *Campanula robinsiae* with a plant of limited range and specialized tolerances in Texas is not a pattern of relationship that can be duplicated by other species pairs. The pattern is common of western species represented in Florida by more or less closely matched equivalents, but the western member is fundamentally of a circum-Gulf distribution and not of an

exclusively inland form. Shetler's speculation (1963), that *C. robinsiae* represents a recent introduction of a Eurasian species, is yet to be confirmed by identification of the foreign population, but still remains the most comfortable and logical explanation for the presence of this plant in Florida.

Campanula L.

Bellflowers

1. Plants robust, stiffly erect (to 0.3 - 1 m. tall) and unbranched; flowers nearly sessile, solitary or in cymes of 2 - 3 (5); corolla rotate, blue; style descending then curving upward, much exceeding the corolla; capsules opening near the top; leaves ovate with acuminate apices, to 35 mm. broad, regularly serrate; annual; very local, on moist heavily shaded calcareous slopes or ledges, along bluffs of Apalachicola River (Gadsden and Liberty counties) and in central Jackson County (Chipola River and tributaries). (March) July - October. [*Campanulastrum americanum* (L.) Small]
TALL BELLFLOWER. C. americana L.

1. Plants delicate, sprawling or weakly ascending (usually not above 0.2 m. tall, the stems (in *C. floridana*) to 0.5 m. long); flowers solitary, on slender erect or ascending pedicels, the style not exceeding the corolla.
2. Calyx lobes equalling the length of the corolla lobes; hypanthium turbinate, the capsule opening near the middle; corolla purple; leaves lanceolate, to 5 mm. wide, the surface papillate and margin revolute with distant gland-teeth; weak-based sprawling perennial; grassy roadsides, meadows, creek banks, and pond margins, frequent; peninsular Florida, from Collier County north to Taylor, Lafayette, and Putnam counties, endemic. March - June. [*Rotanthea floridana* (S. Wats.) Small]
FLORIDA BELLFLOWER. C. floridana S. Wats. ex Gray

2. Calyx lobes half the length of the corolla lobes; hypanthium subglobose, the capsule opening near the bottom; corolla light blue; leaves ovate, to 4 mm. wide, the surface smooth and the margin plane with few acute teeth; sprawling annual; moist seepage area on slope of Chinsegut Hill, Hernando County, endemic; exceedingly rare and now perhaps extinct (the last known collection: *G. R. Cooley* 6029, 26 Apr 1958, USF). April - May. [*Rotanthea robinsiae* (Small) Small]
CHINSEGUT BELLFLOWER. C. robinsiae Small

LOBELIA

Three recent workers have contributed substantially to our understanding of the genus *Lobelia*: R. McVaugh (Rhodora 38:241-

263, 276-298, 305-329, 346-362. 1936; Am. Midl. Nat. 24:681-702. 1940; N. Am. Fl. 32A:35-99. 1942), F. E. Wimmer (Pflanzenreich, heft 107:408-695. 1953), and W. M. Bowden (Bull. Torrey Bot. Club 86:94-108. 1959; Can. Jour. Gen. Cyt. 1:49-64. 1959; 2:11-27. 1960; 2:234-251. 1960). Few consequential surprises are to be expected following their thorough and diverse treatments.

Difficulties of identification within *Lobelia* in Florida lie almost entirely in the group of blue large-flowered species: *L. amoena*, *L. brevifolia*, *L. glandulosa*, and *L. puberula*. Although this group has been given special attention by Bowden (1959) and the species seem well-defined, hybrids or apparent hybrids occur with some frequency. Perhaps the most often encountered is an obvious intermediate between *L. brevifolia* and *L. puberula*, but with nearly equal frequency individuals may be observed that carry only a subtle indication (perhaps a single calyx-lobe tooth) of gene flow. As one perplexing example, most collections of *L. puberula* in the more southern portion of its range show non-glandular teeth on the calyx lobes that suggest introgression from *L. brevifolia*, but in a part of the state where that species does not occur. Occasional individuals of *L. brevifolia* with glabrous hypanthia and *L. glandulosa* with long-hirsute hypanthia may be reflecting the influence of *L. amoena* and *L. puberula*, respectively.

Lobelia L.

Lobelias

1. Corolla bright red; flowers large (filament-tube 25 - 30 mm. long); medium to large (to more than 2 m. tall, with stems 2.5 cm. in dia.) perennial herb; wet woodland soils, usually along brooks or rivers, or (in peninsular Florida) emergent from streams or supported by floating vegetation, conspicuous but usually not common; Panhandle Florida and south in the Peninsula to Hillsborough and Orange counties. July - November. [Plants in the western Panhandle are of moderate size and are consistently terrestrial; they represent var. *cardinalis*. In the Peninsula the species is often much more robust, with pronounced horizontal bases and stout aerenchyma-filled stems that float or are supported in the water of spring runs and along the edges of clearer rivers; such plants are endemic and are known as var. *meridionalis* Bowden.]

CARDINAL-FLOWER.

L. cardinalis L.

1. Corolla of blue or lavender shades, or white; flowers small to medium (filament-tube not above 10 mm. long).
2. Leaf blades ovate to orbicular, scarcely longer than broad; petioles apparent; flowers small (filament-tube 3 mm. long or less).

3. Blades entire to inconspicuously crenate, mostly under 1 cm. long; ovary more than half inferior; corolla blue with white throat; delicate annual, usually little more than 10 cm. tall, the stems decumbent to weakly erect; moist roadsides and savannas, locally abundant; peninsular Florida, south to Collier County; endemic. (December) February - May.

L. feayana Gray

3. Blades conspicuously toothed, 1.5 - 3 cm. long; ovary less than one third inferior; corolla pale lavender with white throat, or wholly white; erect annual, often to 30 - 50 cm. tall; occasional in moist to dry hammocks, citrus groves, roadsides, and cultivated fields; peninsular Florida, from St. Johns County and Citrus County, south to Collier County; endemic. February - May. [*L. cliffortiana* L., in error; *L. cliffortiana* var. *xalapensis* Gray]

L. homophylla Wimmer

2. Leaf blades variously ovate, lanceolate, oblanceolate, or linear, appreciably longer than broad (small orbicular rosette leaves sometimes present in *L. nuttallii*, but cauline leaves linear); petioles absent or confluent with the blade; flowers small to medium.

4. Leaves mostly basal, oblanceolate to spatulate, the cauline ones greatly reduced (see also *L. flaccidifolia*).

5. Corolla small (filament-tube 3 - 4 mm. long), with open slit between lateral petals ("fenestrate"), white or pale lavender; moist savannas, open grassy flatwoods, and ditch banks, frequent; nearly throughout Florida, from Dade County northward, and west to the central Panhandle (Bay County). April - June (August).

L. paludosa Nutt.

5. Corolla medium (filament-tube 7 mm. long), lacking slit (non-fenestrate), pale pinkish lavender; wet ditches, and shallow cypress or flatwoods ponds, infrequent; Panhandle Florida (Leon County, westward). July - October.

L. floridana Chapm.

4. Leaves mostly cauline, variously linear to ovate.

6. Cauline leaves linear to filiform; flowers small (filament-tube 3 - 4 mm. long).

7. Plants delicate, weakly erect; cauline leaves linear, glabrous; basal leaves (if present) broadly ovate to orbicular, 0.5 - 1.5 cm. long, densely strigose above; pedicels 3 mm. long, much shorter than flower;

corolla lavender-blue, lighter in throat; among deep wiregrass of moist pinelands and savannas, frequent; Panhandle Florida, from the Apalachicola River westward. April - October.

L. nuttallii Roem. & Schult.

7. Plants stiffly erect, from creeping rootstock; cauline leaves filiform, very reduced; basal leaves lacking; pedicels 6 - 10 mm. long, longer than flower; corolla pale blue; emergent from shallow water of cypress ponds and ditches, rare but sometimes abundant where found; northern Panhandle Florida (Okaloosa, Jackson, Gadsden counties). May - July.

L. boykinii Torr. & Gray

6. Cauline leaves various, but in most, broader than linear (if linear, as in *L. glandulosa*, then flowers medium (filament-tube 8 - 10 mm. long)).

8. Leaves small (1 - 2.5 cm. long), pectinately toothed, numerous (12 - 80), stiffly spreading from stem; calyx lobes pectinately lobed, the basal auricles large and covering the hypanthium; hypanthium long-hirsute (rarely glabrous); corolla lavender-blue, medium in size (filament-tube 7 mm. long); moist pinelands, frequent; Liberty and Franklin counties on east side of Apalachicola River, westward through the Panhandle. August - November.

L. brevifolia Nutt. ex A. DC.

8. Leaves larger (3 - 10 cm. long), serrate to nearly entire, few (5 - 20), often lax; calyx lobes toothed or entire, the basal auricles not covering the hypanthium.

9. Leaves linear or narrowly lanceolate, glabrous; hypanthium glabrous (rarely long-hirsute); calyx lobes glandular toothed; corolla light purple, medium in size (filament-tube 8 - 10 mm. long); stem and leaves brittle; frequent in wet soil of pine flatwoods, ditches, and low meadows; throughout Florida. (March - April) September - January.

L. glandulosa Walt.

9. Leaves ovate to elliptic.

10. Flowers small (filament-tube 4 - 5 mm. long); hypanthium minutely hirsute along veins; lower cauline leaves usually larger, finely crenate;

wet riverbottom forest, rare; along Yellow and Shoal rivers and tributaries, Okaloosa County, western Panhandle. June - October.

L. flaccidifolia Small

10. Flowers medium (filament-tube 6 - 8 mm. long); hypanthium long-hirsute or glabrous; median leaves usually larger, serrate.

11. Leaves densely puberulent beneath; hypanthium long-hirsute or glabrous; calyx lobes usually entire; corolla lavender with white throat; dry to moist woods, frequent; north Florida, throughout the Panhandle and in the northern Peninsula south to Hernando and Brevard counties. September - October. [Hybrids with *L. brevifolia* are frequent, characterized by pectinately toothed calyx lobes and more numerous leaves.]

L. puberula Michx.

11. Leaves glabrous beneath, with a whitish parchment-like texture when dry; hypanthium glabrous; calyx lobes toothed (rarely entire); corolla lavender without white throat; along creeks or on hummocks in seepy areas; moist to wet usually dense woods, rare; Panhandle Florida, east to Leon County, and disjunct to Marion County (Juniper Creek) in the north-central Peninsula. September - November. [Two varieties may be recognized in Florida. Most plants have prominently glandular-toothed calyx lobes and are var. *glandulifera* Gray (*L. glandulifera* (Gray) Small; *L. georgiana* McVaugh). Those with entire lobes seem restricted to Leon and Jackson counties; they are var. *amoena*.]

L. amoena Michx.

Excluded Species

Lobelia cliffortiana L. This native of the New World tropics has been attributed to Florida apparently on the basis of confusion with the very similar *L. homophylla*. It is separated from the latter by a capsule that is more than half inferior, in contrast to the nearly superior capsule of the Florida endemic.

Lobelia elongata Small. This narrow leaved plant of the Carolina coastal marshes was reported for Florida by Bowden (1960) on the basis of a glabrous leaved Leon County collection (*H. Kurz*

in 1942, FLAS). The broadly ovate leaves and the "piney woods" habitat, however, are typical of *L. puberula*.

SPHENOCLEA

The inclusion of *Sphenoclea* in the Campanulaceae is more a matter of precedent and convenience than conviction of natural alliance. Its true relationships may be elsewhere. H. K. Airy Shaw (Flora Malesiana 4(1):27-28. 1948) has noted similarities both to the Phytolaccaceae and the Primulaceae and has suggested that its proper treatment is as the monogeneric family Sphenocleaceae. Certain other authors (e.g., Backer, Flora of Java, 1965; Heppner in Hutchinson & Dalziel, Flora of West Tropical Africa 2:307. 1963) have accepted this analysis. J. Hutchinson (Families of Flowering Plants 1:476-477. 1959), however, has seen the resemblances to the Phytolaccaceae as superficial and a consequence of parallel evolution, and has retained *Sphenoclea* as a genus within the Campanulaceae.

Sphenoclea Gaertn.

1. Erect soft-stemmed herb, to 100 cm. tall; leaves elliptic, acute, entire; inflorescences spicate, terminal or on lateral branches; flowers small, closely crowded; corollas whitish, minute, soon surpassed by enlarged green calyx lobes; capsule circumscissile; seeds very numerous, minute; wet areas, along ditches or emergent from shallow water, sometimes forming a belt around lake margins, rare; a chance introduction, often not persisting, in peninsular Florida (Alachua, Hillsborough, Manatee, Osceola counties). August - October.

GOOSEWEED.

S. zeylanica Gaertn.

TRIODANIS

For many decades North American botanists comfortably treated the following two native species as members of the European genus *Specularia*. Even the common name, Venus' Looking-glass, was a medieval allusion to the resemblance of the flowers of the Mediterranean *S. speculum-veneris* to the ancient round bronze mirror, or speculum.

The rationale for segregating the largely American species of *Triodanis* has been presented with thoroughness by R. McVaugh (Wrightia 1:13-52. 1945; Rhodora 50:38-49. 1948). The justification lies in the scant differences between *Specularia* as it has previously been defined, and the large and heterogeneous genus *Campanula*. If *Specularia* is broken into smaller homogeneous groupings, of which *Triodanis* is among the most clearly delimited,

Campanula may be increased by the inclusion of some of the species of closest affinity but without becoming too large or unworkably diverse. As segregated, all species of *Triodanis* produce cleistogamous flowers, which are not known in *Specularia* sensu stricto. *Triodanis* is further characterized by the combination of annual habit, deeply divided corolla, a capsule longer than wide and opening near the apex, and a spicate inflorescence.

McVaugh's appraisal has been disregarded by many contemporary American floristic writers (cf. Gleason, 1952; Radford, 1968), and has been disputed by M. L. Fernald (*Rhodora* 48:209-214. 1946). A careful reading of Fernald's position and of McVaugh's reply (1948), however, suggests that Fernald did not fully comprehend the untenability of *Specularia* as a genus distinct from *Campanula* if *Triodanis* is not segregated, and that precedent rather than evolutionary structure may have been the primary determinant behind the retention of *Specularia* for the American plants. The use of *Triodanis* in floristic works dealing with native American species is therefore to be encouraged.

A recent study by T. R. Bradley (*Brittonia* 27:110-114. 1975) has proposed that the plants treated here be seen as a single species with two varieties. Bradley's justification was the ease with which the morphological extremes were crossed in cultivation and the presence of plants of hybridlike morphology in natural populations. Bradley acknowledged the correlation of several strong characters (leaf and bract shape, degree of cleistogamy, capsule valve position, seed surface pattern), as well as ranges which coincide only in part. But previous workers have not reported difficulty in distinguishing the populations which constitute the two recognized species, and observation of sympatric situations during the present study revealed few or no intermediates. It is clear that isolating mechanisms are operating under field conditions. Elevation of the rank of "variety" so that it would apply to populations as discrete as the two morphological extremes of eastern North American *Triodanis* would be a significant and unacceptable expansion of its traditional meaning.

Triodanis Raf.

Venus' Looking-glass

1. Pores at or very near apex of the capsule; leaves and floral bracts usually longer than broad, with no more than one pair of lateral veins; one (rarely 2) purple flowers opening at summit of stem (the lower flowers being cleistogamous); annual herb; moist to dry roadsides, fallow fields, frequent; northern Florida (south to Marion and Hillsborough counties). April - May. [*Specularia biflora* (R. & P.) Fisch. & Mey.; *Triodanis perfoliata* var. *biflora* (R. & P.) Bradley]

T. biflora (Ruiz & Pavon) Greene

1. Pores nearly midway between base and apex of capsule; leaves and floral bracts usually as broad as or broader than long, with several pairs of lateral veins; several purple flowers opening along the upper axis (the lower flowers being cleistogamous); annual herb; moist to dry roadsides, fields, groves, and waste areas, usually in sandy soils, common; north and central Florida (south to Hillsborough and Polk counties). February - April.
[*Specularia perfoliata* (L.) A. DC.]

T. perfoliata (L.) Nieuwl.

WAHLENBERGIA

This genus is large, with perhaps 150 species, most of them in the southern hemisphere. It was not present in the Southeast until comparatively recent times. *Wahlenbergia marginata*, from Asia, apparently was first known in Florida in 1937 when collected in Alachua County (W. A. Merrill, Gainesville, FLAS). By 1940 and 1941, respectively, it was in the central Panhandle (Chipley, Washington County, FLAS) and midway down the Peninsula (Leesburg, Lake County, FLAS). It now probably occurs in all areas north of the central Peninsula, with collections being known from twenty-four counties, but it has not spread appreciably south of the early Lake County station.

Wahlenbergia linarioides, of southern South America, was first collected in Florida in 1958 (R. K. Godfrey 56689, FSU), from West Pensacola, Escambia County. In 1971 it appeared in the northeastern part of the state (G. H. Morton 4737, Camp Blanding, Clay County, NY), and in 1973 at a point midway between, in the central coastal Panhandle (R. K. Godfrey 72348, Carrabelle, Franklin County, FLAS, FSU).

The following key is expanded from R. K. Godfrey (Sida 1:185-186. 1963).

Wahlenbergia Schrad. ex Roth

1. Hypanthium in flower 3.5 - 4.5 mm. long, narrowly obconical to subcylindrical, in fruit up to 12 mm. long, opening by 2 terminal valves; seeds broadly elliptic; corolla pale blue; perennial herb, usually with several curving-erect stems unbranched below the inflorescence, to 50 cm. tall; dry sandy soil, in waste areas, among scrub vegetation of stabilized dunes, and on roadsides, rare; north Florida (Escambia, Franklin, Clay counties). April - June.

W. linarioides (Lam.) A. DC.

1. Hypanthium in flower 1.5 - 3 mm. long, ellipsoid or ovoid, in fruit up to 7.5 mm. long, opening by 3 terminal valves; seeds oblong; corolla purplish blue; annual or short-lived perennial herb, with delicate simple to branched erect stems, to 40 cm. tall; moist to dry soils of waste areas, roadsides, old fields, and stream banks, common; northern Florida, south in the Peninsula to Hillsborough and Lake counties. March - September.

W. marginata (Thunb.) A. DC.

EXCLUDED GENERA

Hippobroma longifolia (L.) G. Don (*Isotoma longiflora* (L.) Presl; *Laurentia longiflora* (L.) Peterm. in Engl.) Madam Fate, Devil's-jessamine, Horse-poison. This native of the American tropics has been reported for Florida on the authority of McVaugh (Bull. Torrey Bot. Club 67:778-798. 1940; N. Am. Flora 32A:100. 1943). His basis was a collection bearing the printed data: "Florida. F. Rugel: 1842 - 1849." Ferdinand Rugel collected extensively in Florida during those years, but, as has been noted elsewhere (Castanea 33:79. 1968), he was also active in Cuba during the same time span and the labels do not always reflect the probably source of his specimens. No indisputable Florida collections are known, and the plant is not believed to occur in the state.

Hippobroma has attractive long (80 - 160 cm.) salverform white corollas. It has been cultivated as an ornamental and has spread widely in tropical areas as an escape and as a chance introduction. Introduction of this plant into Florida, or its cultivation under conditions from which it might escape, would verge on the irresponsible in view of its record as one of the most toxic species in the Americas. The foliage is extremely poisonous to stock, and a drop of the milky juice splashed into the eye is reputed to cause blindness. Its common names reflect the reputation it holds in its native lands.

STUDIES ON SPOROTHRIX SCHENCKII HEKTOEN AND PERKINS
AS A SAPROPHYTE IN NATURE

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Introduction: The filamentous fungus Sporothrix schenckii Hektoen and Perkins has the ability to grow on decaying vegetation in nature while as a parasite the organism can cause mycoses in animals and in man (Baker, 1971; Jungerman and Schwartzman, 1972). Of 250 native and newly naturalized flowering plant species found in Taiwan, 114 supported no growth, 65 supported moderate growth, 37 supported good growth while 35 species induced abundant mycelial and conidial production of S. schenckii as a saprophyte (Volz and Pan, 1976).

Reports are limited on the ability of the organism to infect living plant tissue. Benham and Kesten (1932) suggested the capability of S. schenckii to infect carnations causing bud wilt. Although S. schenckii has been isolated many times from plants in relation to human epidemics of sporotrichosis (Emmons et al., 1977; Foerster, 1926; Rippon, 1974), the species was never substantiated as a causative agent in plant disease. The purpose of this study is to examine the phytoalexins stimulated by Sporothrix schenckii to further identify the relationship of the organism to higher plants.

Literature Review: The stimulation of phytoalexins by pathogenic and nonpathogenic organisms is indicative of infectivity in plants (Varns, 1971). Phytoalexins are phenolic compounds that exhibit antifungal activity in living plants. Müller (1958) was the first to postulate the existence of fungistatic compounds while studying potato tubers with virulent and avirulent races of Phytophthora infestans in late blight of potato. Since then additional compounds have been isolated from plants in response to fungal infection. Plant systems examined included sweet potato (Kim and Urtani, 1974; Urtani, 1971, 1963), orchid (Fisch et al., 1973, 1972), carrot (Condon and Kuc, 1960; Hampton, 1962), potato (Sato et al., 1968; Tomiyama et al., 1968a; Varns, 1970; Varns, Kuc and Williams, 1971), barley, green pepper, rice, turnip (Metlitskii and Ozeretskovskaya, 1968), bean (Pierre, 1971; Pierre and Bateman, 1967), soybean (Keen et al., 1971), alfalfa (Higgins and Millar, 1968), French bean (Deverall et al., 1968; Pierre and Bateman, 1967; Rahe et al., 1969), safflower (Allen and Thomas, 1971a, b, c), strawberry (Mussell and Stoeple, 1971), chili pepper (Bhullor et al., 1972), pepper fruits (Müller, 1958; Stoessel et al., 1972; Van den Ende, 1969), parsnip (Johnson and Brannan, 1973). Fungistatic compounds isolated from plants include ipomearone (Metlitskii and Ozeretskovskaya, 1968), Pisatin (Cruickshank and Perrin, 1963, 1961,

1960), isocoumarin (Condon and Kuc, 1960), phaseolin (Cruickshank and Perrin, 1963), phytoberin and rishitin (Varns, 1971; Tomiyama et al., 1968b), xanthotoxin (Johnson and Brannan, 1973), and 6a-hydroxyphaseollin (Keen et al., 1971).

Phytoalexins, like antibodies, seem to be stimulated in response to infection as well as to the introduction of foreign substances. Pathogens as well as nonpathogens and chemical substances are capable of stimulating a response in plant tissue. Inhibiting substances can be stimulated by a wide variety of organisms and chemicals, the substances are nonspecific in their action. In addition, the same compound may be produced in response to several different organisms. The reactions can vary according to the amount of compound produced or in the toxicity level against the invader (Varns, 1971). The rate of phytoalexin production by the host is also important in controlling the invader. Phytoalexin response of both resistant and susceptible host varieties are apparently similar but the former produces phytoalexins more quickly and possibly in larger quantities (Müller and Borger, 1940; Varns, 1971).

Classical theories on the action of phytoalexins indicate that a stimulation in the plant by the primary fungal invader occurs, and that the response toward this stimulation results in the death of the invader. Pathogens have the ability to degrade phytoalexins and are unaffected by their action. Nonpathogens are unable to degrade phytoalexins, and growth is prevented (Higgins and Millar, 1970; Wit-Eshove, 1969). Infection of potato cultivars by strains of Phytophthora infestans produce antifungal compounds rishitin and phytoberin (Sato et al., 1968; Varns et al., 1971). Hypersensitive resistance is controlled by a series of major genes called "R genes" that permit some races of Phytophthora infestans to become infective and others not infective (Friend, 1973). The amount of phytoalexin accumulated in the plant depends on the type of R-gene present and the parasite race introduced in the host (Sato et al., 1968; Varns et al., 1971).

The role of phytoalexins in disease resistance in plants has also been examined. Kiraly et al. (1972) concluded that on death or inhibition of the fungus, endotoxins are released which stimulate phytoalexin production. This would place the phytoalexin role in plant resistance at the point of inhibiting secondary infection (Van der Plank, 1975). Saprophytic organisms existing on the surface of a plant would remain suppressed. Phytoalexins as plant defense mechanisms have attracted increased attention by researchers (Christensen, 1969; Higgins and Millar, 1970; Sato et al., 1968; Varns et al., 1971; Wit-Eshove, 1969). It is apparent that phytoalexins act as inhibitors of incompatible potential invaders and show ineffectiveness against compatible or virulent pathogens.

Materials and Methods: Carnation buds, potential hosts for Sporothrix schenckii (Benham and Kestan, 1932), were injected with

viable conidia collected from 4 week old colonies grown on Sabouraud dextrose agar. Control buds received 1 ml 1% sterile sucrose solution and additional control buds received no treatment. All carnation buds were examined for the presence of phytoalexins. Inoculated excised buds were incubated at room temperature in sterile petri plates containing sterile filter paper. All buds were carefully examined for the presence of other fungal species other than S. schenckii, and buds found with contaminants were eliminated. Buds with S. schenckii induced deterioration were collected and placed in a Waring blender in 95% ETOH. After blending, particles were extracted in a Soxhlet extractor in 95% ETOH. Control groups were extracted in the same manner. Extracts were purified by paper chromatography using n-butanol, acetic acid, and water, 4:2:1 v/v/v (Hampton, 1962). Chromatographic spots were detected with ultraviolet light. Thin layer chromatography further purified the extracts.

The antifungal activity of S. schenckii in each chromatographic spot was examined. The spots were removed and placed on dialysis tubing coated with Sabouraud dextrose agar containing streptomycin. At the edge of the spot an inoculation was made of S. schenckii conidia. Hyphae were allowed to grow at room temperature to partially cover the chromatographic spot. Undisturbed hyphal apices with the supporting dialysis tubing were removed and mounted on slides with lactophenol cotton blue (Volz and Niederpruem, 1968).

Studies on the ability of potato tubers to respond toward S. schenckii were also initiated. Twenty grams of peeled, sliced potato tubers were aseptically placed in sterile petri plates containing filter paper. Inoculations of 2 ml conidial suspension were added to each potato test. Control potato plates were treated with 2 ml sterile sucrose solution. At 4 days incubation the test potatoes contained a heavy growth of S. schenckii. Extraction of phytoalexins followed using 20 g samples from each plate. Previously described assay methods were used to measure antifungal activity of the extracts. Extract purification by thin layer chromatography was carried out (Lyon, 1972; Varns et al., 1971). Ethanol extracts were further treated with water and chloroform to final volume 3:2:1 v/v/v of ethanol, water and chloroform. The mixture was then shaken in a separatory funnel 1 minute and allowed to separate into phases for 1 hour. The chloroform phase was removed. The aqueous phase twice extracted with the same volume of chloroform, and all chloroform extractions were combined. Chloroform phases of both control and test systems were completely evaporated and redissolved in acetone. The extract was applied to thin layer silica gel chromatographic plates (Kodak) using a solvent system of cyclohexane / ethyl acetate, 1:1 v/v. Detection of spots occurred by spraying with chloroform saturated with antimony chloride. Similar plates using chloroform / ethyl acetate 1:1 v/v were used. Each plate was examined under UV light before and after spraying with the developer. Photographs of the plates were taken.

Results: Carnation buds were selected for study due to their capability of infection by S. schenckii (Benham and Kesten, 1932). Potato tubers were selected to test the ability of S. schenckii to attack a common food supply grown in soil vulnerable to soil microbes. Paper chromatography of extracts revealed a variation of migrations in both carnation buds and potato tubers infected with S. schenckii as compared to their respective controls. Carnation chromatographic spots I and II were found in carnation control group (CC), carnation fungal contaminant control (CFC), and the carnation test (CT) while spots III, IV and V were found in both CFC and CT. Spot (a) was found in the test (CT) and control (CC) groups, and spot (b) was located only in the control (CC). All spots from each extract fluoresced under 254 nm UV light. Only spot V found in CT and CFC chromatograms fluoresced red instead of yellow (Tables I,V).

Extracts from infected potato tubers contained 4 migratory spots while extracts from uninfected potatoes exhibited 3 separations with paper chromatography (Table II). Spots designated as 1,2,3, and 4 corresponded to an increase in Rf value. Migration 4 was present only in the infected potato tubers while separations 1,2, and 3 were found in both inoculated and control tissue in apparently equal amounts.

Observations on hyphal growth of S. schenckii in association with most chromatographic spots demonstrated some inhibitory response to the growth rate compared with control. Abnormal growth patterns of S. schenckii hyphae grown on dialysis membrane in contact with inhibitory chromatographic migrations included no growth or independent growth of an isolated individual filament. Undisturbed colony sections grown on dialysis tubing covered agar, mounted in lactophenol cotton blue, indicated normal hyphal growth including branching patterns of parallel hyphae, and parallel hyphae tightly organized in a pyramid arrangement terminating in a leader hypha.

Thin layer silica gel chromatography was selected to clarify variation noted in extracts of control and inoculated tissue. With chloroform and ethyl acetate as the migratory phase in the carnation study, isolated extracts corresponded to those found in the previous carnation study (Table III). Migration I appeared only in the CFC group while II and IV appeared in CFC and CT groups. Spot III was present in CC, CFC, and CT groups.

Thin layer chromatography with carbon tetrachloride and ethyl acetate as the migratory phase was made with the potato tuber study (Table IV). The potato chromatographic spots migrating at the same Rf value when viewed under UV light at 254 nm before chemical spraying indicated that the predominant spot occurs in the uninoculated potato (PuI). After spraying the chromatograph with chloroform saturated with antimony trichloride (Lyon, 1972; Varns et al., 1971), the predominant spot was noticed in inoculated potato tubers (PiI). A change in color in the control extract upon treatment with the developer was also noted.

Carnation extracts produced numerous migratory separations in thin layer chromatography (Table V). The carnation control group (CC) did not produce many migrations. Extracts CT and CFC were composed of similar migrations, however, variation occurred in treating the plates with UV radiation and with the developer of chloroform saturated with antimony trichloride. Each spot found in the CT group was found in the CFC group with the exception of migration II.

Discussion: Sporotrichosis is a disease of importance to man causing cutaneous, subcutaneous, and systemic involvements. The causal organism, Sporothrix schenckii, is found in nature associated with soil containing high levels of organic matter and with living plants. Benham and Kesten (1932) carried out early studies with the fungal isolate and demonstrated infectivity in carnation, rose, barberry, and June grass. In the current study, host plant phytoalexin production and fungal infectivity were examined.

A variation in separatory migrations was noted in extracts obtained from S. schenckii infected carnation buds. The control demonstrated a similar pattern to the carnation test except spot (a) was found in CT and not in CFC (Table I). Plants inoculated with sterile sucrose or sterile sucrose containing conidia had more migrations compared to the carnation control. The plant capable of responding to either physical injury or S. schenckii infection is clearly evident. Both the CFC group and CT group contained phytoalexins presumably in response to a surface contaminant or S. schenckii infection.

Carnation spot (b) was only found in extracts from the carnation control (CC) which possibly could be a precursor substance which was changed slightly on growth of surface contaminants or introduction of S. schenckii. Migratory separations unique to tissue infected with S. schenckii were not found. The quantity or size of spots detected indicate that the same amount of phenol was present from both CT and CFC groups and a variation in size and number of spots was only slightly significant when compared to the CC control. Apparently S. schenckii is incapable of stimulating an additional response in carnation buds.

Hyphal growth rates and hyphal morphology were observed with S. schenckii grown in contact with chromatographic separations obtained from carnation. Phenolic antifungal activity of the spots was detected by growth inhibition and abnormal hyphal morphology. An inhibitory response was noted more frequently with CT and CFC extracts than from CC. Corresponding spots from each group demonstrated varying degrees of activity. Migration I, present in all three extracts, presented similar colony inhibition while microscopically greater variation occurred with greatest inhibition in CT. A similar situation existed with CT III and CFC III, with CFC III having the greatest inhibition. Migration groups CT and CFC displayed greater inhibitory responses than did group CC. The

response in carnation is attributed to the presence of S. schenckii in the host plant or possibly an undetected surface contaminant.

Thin layer chromatography of carnation extracts was employed to note possible additional separations not found in the other selected method. The chloroform and ethyl acetate solvent system revealed four spots upon UV irradiation (Table III). Migration I appeared only in the CFC group while II and IV were present both in CFC and CT groups. Separation III appeared in all groups, the controls and the test groups. Carbon tetrachloride and ethyl acetate solvent system revealed 5 separations in the test material (Table V). The control group (CC) displayed a faint migration which was present in the other extracts. The carnation contaminant control (CFC) produced spots I, III, IV, and V. Only spot II was unique to the test group which was detected at Rf 0.44 after developing the chromatograph with chloroform saturated with antimony trichloride. Paper chromatography omitted some separatory spots and one missed was unique to carnation buds infected with S. schenckii.

Potato tubers inoculated with S. schenckii clearly indicated with paper chromatography that potatoes were stimulated to produce phenolic compounds. Chloroform and ethyl acetate as the moving phase in thin layer chromatography produced three migrations. Spots I and III were found in both control and test material while other spots were present only in the inoculated tubers indicating the production of phenolic compounds. The carbon tetrachloride ethyl acetate solvent system isolated only one migration each on UV irradiation in control (PuI) and test potato (PiI) tuber material inoculated with S. schenckii. A faint blue spot was noticed at Rf 0.56 of the infected tubers while a strong blue spot was noticed in the uninfected tubers. After spraying with the developer, chloroform saturated with antimony trichloride, the migration from infected potato tubers was large in size and blue in color. The separation from uninoculated tissue was beige and moderate in size.

Potatoes have been known to produce two phytoalexins, rishitin and phytuberin (Lyon, 1972; Sato et al., 1968; Varns et al., 1971). With the same solvent system and thin layer chromatography, Varns et al. (1971) and Lyon (1972) found rishitin and phytuberin to migrate at Rf values of 0.3 and 0.7 respectively. The compound detected in potato tubers infected with S. schenckii appears to be rishitin primarily due to coloration and migratory properties.

Phytoalexins are universally found in the plant kingdom. Both carnation and potato responded to infection with S. schenckii by producing phytoalexins. Benham and Kesten (1932) reported S. schenckii capable of producing carnation bud wilt. According to Varns et al. (1971), Christensen (1969), and Higgins and Millar (1968), susceptibility is a result of a suppression of the plant's response. Organisms normally pathogenic for a specific plant, carrying the correct R gene, are capable of suppressing the formation of phytoalexins in order to attack the host. Nonpathogens are

not capable of suppressing the plants response and are thus inhibited. Sporothrix schenckii is not a pathogen of potatoes since the fungus is inhibited by the phytoalexins and apparently it can not break down the complex chemical structures. A mild variation in inhibition was noted between CFC and CT in the carnation studies which would indicate the possibility of S. schenckii is a pathogen of carnations.

Table I

Compounds Isolated from Phytoalexin Studies
of Carnation Buds Inoculated with
Sporothrix schenckii

| Spot designation | Rf value | Reaction with UV illumination at 254 nm |
|------------------|----------|--|
| I | 0.17 | yellow |
| II | 0.30 | yellow |
| III | 0.42 | yellow |
| IV | 0.49 | yellow |
| V | 0.57 | red |
| a | 0.043 | yellow |
| b | 0.54 | yellow |

Table II

Compounds Isolated from Phytoalexin Studies
of Potato Tubers Inoculated with
Sporothrix schenckii

| Spot designation | Rf value | Reaction with UV illumination at 254 nm |
|------------------|----------|--|
| I | 0.19 | yellow |
| II | 0.23 | yellow |
| III | 0.34 | yellow |
| IV | 0.91 | blue |

Table III

Separations of Carnation Extracts Using
Chloroform and Ethyl Acetate as the Migratory Phase

| Spot designation | Rf value | Reaction with UV illumination at 254 nm |
|------------------|----------|--|
| I | 0.24 | red |
| II | 0.50 | red |
| III | 0.62 | red |
| IV | 0.72 | red |

Table IV

Potato Extracts Purified by Thin Layer Chromatography
Using Carbon Tetrachloride and Ethyl Acetate
as the Migratory Phase

| Spot designation | Rf value | UV illumination and spot size | Antimony trichloride in chloroform, and spot size |
|---------------------|-------------|----------------------------------|--|
| PiI | 0.56 | light blue, small | strong blue, large |
| PuI | 0.56 | strong blue, large | beige, small |

Table V

Carnation Extract Separations in Thin Layer
Chromatography with Carbon Tetrachloride / Ethyl Acetate
as the Migratory Phase

| Spot designation | Test Group appearance | Rf value | UV illumination at 254 nm | Developer reaction |
|---------------------|-----------------------|----------|------------------------------|-----------------------|
| I | CFC, CT (faint) | 0.26 | red | beige |
| II | CT | 0.44 | absent | beige |
| III | CFC, CT | 0.59 | red | absent |
| IV | CFC, CT | 0.65 | absent | beige |
| V | CFC, CT, CC (faint) | 0.71 | absent | beige |

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ADDITIONAL NOTES ON THE GENUS LIPPIA. VI

Harold N. Moldenke

LIPPIA BRACTEOSA (Mart. & Gal.) Moldenke

Additional bibliography: Moldenke, Phytologia 38: 482. 1978.

Recent collectors describe this plant as a shrub, 1.5—2.5 m. tall, and have found it growing on steep heavily wooded slopes and in steep-walled canyons with tropical deciduous forest of Hauya, Euphorbia, Diospyros, Cedrella, Trichilia, and Heliocarpus, at altitudes of 800—1200 m., flowering in February and December, and fruiting in December. Cruz Cisneros reports finding it in "huerto de frutales en elfondo de barranca con bosque tropical deciduo de Bursera". The corollas are said to have been "pale-yellow" on Breedlove 23049.

The Webster, Miller, & Miller 11443, distributed as L. bracteosa, is actually L. graveolens H.B.K.

Additional citations: MEXICO: Chiapas: Breedlove 14194 (Ld), 23049 (Ld, N); Laughlin 659 (Ld); F. Miranda 4937 (W—2508307); Purpus 10146 (Mu), 10380 (Mu); Ton 3403 (Ld, Mi). Michoacán: Diguet s.n. [Octobre 1907] (W—2565945). Oaxaca: Cruz Cisneros 2351 (Mi); Pringle 6175 (Ms—30878, Mu—1821). State undetermined: Karwinski s.n. (Mu—20, Mu—22).

LIPPIA BRADEANA Moldenke, Phytologia 32: 334—335. 1975.

Bibliography: Moldenke, Phytologia 32: 334—335 (1975) and 34: 258. 1976; Anon., Biol. Abstr. 61: AC1.640. 1976; Hocking, Excerpt. Bot. A.28: 259. 1976.

Material of this species has been misidentified as and previously reported by me as L. elliptica Schau.

Citations: BRAZIL: Minas Gerais: Duarte 7850 [Herb. Brad. 27897] (N—type).

LIPPIA BRADEANA var. VELUTINA Moldenke, Phytologia 32: 335. 1975.

Bibliography: Moldenke, Phytologia 32: 335 (1975) and 34: 258. 1976; Anon., Biol. Abstr. 61: AC1.640. 1976; Hocking, Excerpt. Bot. A.28: 259. 1976.

Material of this variety has previously been misidentified and distributed as L. eupatorium Schau.

Citations: BRAZIL: State undetermined: J. E. Pohl s.n. (Mu—1118--type, Z--photo of type).

LIPPIA BRADEI Moldenke

Additional bibliography: Moldenke, Phytologia 12: 105. 1965; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 890. 1971.

LIPPIA BURTONII J. G. Baker

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 278 & 281. 1900; Moldenke, Phytologia 13: 349. 1966; Moldenke, Fifth Summ. 1: 230, 237, & 246 (1971) and 2: 890. 1971.

Baker (1900) cites only the original Burton collection from Zaire.

LIPPIA CAFFRA Sond.

Additional bibliography: Moldenke, Phytologia 13: 349. 1966; C. A. Sm., Common Names S. Afr. Pl. 601. 1966; Moldenke, Fifth Summ. 1: 256 (1971) and 2: 890. 1971.

LIPPIA CALLENSI Moldenke

Additional bibliography: Moldenke, Phytologia 12: 107--108. 1965; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 890. 1971.

LIPPIA CALLENSI var. VILLOSA Moldenke

Additional bibliography: Moldenke, Phytologia 12: 108. 1965; Moldenke, Fifth Summ. 1: 227 & 230 (1971) and 2: 890. 1971.

LIPPIA CALLICARPAEFOLIA H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 217. 1817.

Additional & emended synonymy: Lippia callicarpifolia H.B.K. ex Loes., Verh. Bot. Ver. Brand. 53: 78. 1912 [not L. callicarpifolia Schau., 1912 & 1959]. Lippia callicarpaefolia H.B.K. apud M. Martínez, Pl. Med. Mex., ed. 2, 608, sphalm. 1939. Lippia callicarpaefolia H.B.K. ex Puig, Bull. Soc. Hist. Nat. Toulouse 103: 319, sphalm. 1967. Lippia callicarpacofolia H.B.K. apud M. Martínez, Pl. Med. Mex., ed. 5, 639, sphalm. 1969.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 217 (1817) and ed. quarto, 2: 268--269. 1818; Hook. & Arn., Bot. Beech. Voy. 305. 1838; Schau. in A. DC., Prodr. 11: 591--592 & 608. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 265. 1858; Barnhart, Bull. Torrey Bot. Club 29: 590 & 597. 1902; F. D. Kern, Mycologia 3: 289. 1911; M. Martínez, Pl. Med. Mex., ed. 1, 449 & 621 (1933) and ed. 2, 445, 450, & 608. 1939; Cummins, Lloydia 3: 16. 1940; O'Gorman, Mex. Flow. Trees 70 & [71]. 1961; Hocking, Excerpt. Bot. A. 10: 271. 1966; Moldenke, Phytologia 14: 404--405. 1967; Moldenke, Résumé Suppl. 16: 23. 1968; M. Martínez, Pl. Med. Mex., ed. 5, 486 & 639. 1969; A. L. Moldenke, Phytologia 18: 124. 1969; Sanchez Sanchez, Fl. Val. Mex., ed. 1, 330, fig. 264B. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Gibson, Fieldiana Bot. 24 (9): 216. 1970; Moldenke, Fifth Summ. 1: 71, 79, & 366 (1971) and 2: 550--552, 555, 557, 559, 600, 658, & 890. 1971; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Troncoso, Darwiniana 18: 339 & 410. 1974; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 75. 1975; Moldenke, Phytologia 28: 431 (1974), 31: 402 (1975), 36: 40 (1977), and 38: 478. 1978.

Additional illustrations: M. Martínez, Fl. Med. Mex., ed. 1, 449 (1933) and ed. 2, 450. 1939; O'Gorman, Mex. Flow. Trees [71] (in color). 1961; Sanchez Sanchez, Fl. Val. Mex., ed. 1, fig. 264B. 1969.

It should be noted here that the emended dates of publication for the H.B.K. works given above have been authenticated by Barnhart (1902).

Recent collectors describe L. callicarpaefolia as a shrub, sub-shrubby climber, or regular aromatic tree, to 8 m. tall, the crown 2 m. wide, and the trunk 40 cm. in circumference (Rosas R. 114). They have encountered it in dry grass, in areas of secondary vegetation, and in sun or partial shade in moderately moist areas, at altitudes of 660—2000 m., flowering in November, and fruiting in February and November. Hinton reports it "not very frequent". The Rosas R. 114, cited below, is placed here tentatively — it is really too immature for certain identification and may actually not even be verbenaceous. The corollas are said to have been "yellow" on Molina R. 21367.

O'Gorman (1961) lists the vernacular names, "Rosa de Castilla, salvia real, salvia poblana. (Not to be confused with the true salvias which belong to the mint family)". He continues: "The flowers of this pretty shrub remind one of the lantanas but differ in that they are rosettes of bracts with tiny flowers almost hidden among them. The heads are about three-quarters of an inch in diameter and are arranged in spikes, the long, rose-hued peduncles springing from the axils of the leaves. The bracts are rose-purple, irregularly overlapping in several ranks. The leaves look very much like those of the lantana.

"Sometimes growing to the size of a small tree, Lippia is more commonly of shrub size. It has been found near México City in the Cañada de Contreras and near Yautepec, Morelos, as well as on the outskirts of Cuernavaca and in the state of Puebla.

"The flowers are used in a tea 'against inflammation'. It is said that an infusion of the leaves and flowers has properties useful as a stimulant."

Gibson (1970) remarks that "The Mexican L. callicarpaefolia, which in its foliage and large flowering heads does resemble L. substrigosa, differs markedly in the dichasial inflorescence and conspicuously colored (rose to purple) bracts".

Martínez (1969) says of L. callicarpaefolia: "Existe en los Estados de México, Morelos, Puebla y Guerrero. Usar el cocimiento de las flores 'contra la inflamación'. La Farmacopea Mexicana dice que la infusión de las hojas y flores al 1% tiene propiedades estimulantes. No debe confundirse con la rosa de Castilla (Rosa centifolia), que se cultiva como ornamental."

Sanchez (1969) adds the vernacular name, "mastranso", and says "Arbusto que mide 2--4 m de altura, con las hojas opuesto-cruzadas, elíptico-lanceoladas, que miden 8-12 cm de largo, con el ápice agudo, la base angosta, borde crenado, escabrosas en la cara superior, tomentosas en la inferior. Flores con las corolas purpúreo-

amarillentas, agrupadas en espigas comprimidas, situadas por grupos en la axilas de las hojas, con las brácteas grandes y ensanchadas." He asserts that in the Cañada de Contreras it flowers in September.

Another vernacular name recorded for the species is "gusanillo". It should also be noted here that the L. callicarpaefolia credited to Schauer (referred to in the synonymy above) belong in the synonymy of L. pringlei Briq., as does also the L. callicarpaefolia var. briquetiana of Loesener.

Loesener (1912) maintained L. bicolor Kunth & Bouché as distinct from L. callicarpaefolia, citing for the former Seler 376 from Morelos and for the latter Seler 2028 from Oaxaca. Concerning the latter collection he notes "Da die Inflorescenzen noch nicht voll entwockelt sind, ist die Bestimmung unsicher" and concerning the former collection "Die Pflanze wurde in Plant. Sel. I. nach der Bearbeitung Schauers in DC. Prodr. XI. als L. callicarpaefolia H.B.K. bestimmt, der seit Schauer für diese Art allgemein üblichen Bezeichnung. Ein genauer Vergleich der Originale zeigt aber, dass der Name L. callicarpaefolia H.B.K. für eine andere Art zu gelten hat."

Kern (1911) lists Puccinia lippiae Speg. from Lippia myriocephala Schlecht. & Cham. (as determined by John Donnell Smith) from Laguna in Amatitlan, at an altitude of 1200 meters [no. 5209]. However, since this host is not known from that province, it is probable that the actual host is L. callicarpaefolia. Cummins (1940) definitely records Prosopidium lippiae (Speg.) Arth. on L. callicarpaefolia on the basis of Holway 5241 from Mexico.

Material of L. callicarpaefolia has been misidentified and distributed in some herbaria as L. kellermanii Greenm. On the other hand, the Karwinski s.n., distributed as L. callicarpaefolia, actually is L. bracteosa (Mart. & Gal.) Moldenke, while Bourgeau 2983 is L. myriocephala var. hypoleia (Briq.) Moldenke, Dunn & Dunn 18631 and Pringle 2743 are L. pringlei Briq., and Hartweg 560 and P. C. Standley 69695 are L. substrigosa Turcz. (erroneously reported as L. callicarpaefolia by me in 1965).

Additional citations: MEXICO: Chiapas: MacDougall s.n. [April 8, 1971] (Ld, N). Guerrero: Hinton 9838 (Se—103339, Tu—112018), 11633 (Se—103425), 14868 (Se—103430). México: Gilly & Simpson 23 (N); J. Rzedowski 21829 (Au—254851), (Ip). Michoacán: Hinton 12383 (Se—103426), 12945 (Se—97684); R. McVaugh 22697 (Ip). Morelos: Ghiesbreght 287 (Mi); Pringle 6201 (Ms—30868, Mu—1828). Veracruz: Rosas R. 114 (Ip, W—2669015). State undetermined: Karwinski s.n. (Mu—21). GUATEMALA: Huehuetenango: Molina R. 21367 (N). CULTIVATED: Germany: Herb. Kummer s.n. [hort. Monac. 1848. 18.XII] (Mu—24), s.n. [VI.1857] (Mu—1193); Herb. Zuccarini s.n. [1846] (Mu—23). LOCALITY OF COLLECTION UNDETERMINED: Pavon 36 ["Peru, 1868"] (P).

LIPPIA CAMPESTRIS Moldenke

Additional bibliography: Angely, Fl. Anal. Paran., ed. 1, 575. 1965; Moldenke, Phytologia 12: 112--113. 1965; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 890. 1971; Moldenke, Phytologia 36: 36 (1977) and 38: 479. 1978.

Hatschbach describes this plant as xylopodiferous, found it growing on rocky campos and on "campo de solo vermelho", flowering in September and October. The corollas are said to have been "yellow" on his nos. 27189 & 37109. Pabst refers to the plant as a subshrub, the flowers [corollas] "yellow, later darkening".

Material of L. campestris has been misidentified and distributed in some herbaria as L. arechavaletae Moldenke.

Additional citations: BRAZIL: Paraná: Hatschbach 27189 (Z), 37109 (Ld). Rio Grande do Sul: Pabst 6614 [E. Pereira 6788; Herb. Brad. 22516] (Mu).

LIPPIA CANDICANS Hayek

Additional bibliography: Moldenke, Phytologia 13: 350. 1966; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 890. 1971.

Recent collectors refer to this plant as a shrub, 2--3 m. tall, and have found it growing in forest margins in areas of rocky sandstone cerrado and open rocky hillsides with white sandy soil sloping down to grassy brejo, creek, and adjacent gallery forest, in cerrado, and "common in capoeira thickets", valley flats, capoeira, and grazed areas of grasses near swampy creek margins, and in campos bordering on gallery forests in areas of grassy meadows and adjacent sandy campo, at altitudes of 700--1300 m., flowering from January to March. The corollas are said to have been "white" on Irwin & al. 21991, "white, the tube yellow within" on their no. 28042, and "white, the throat yellow" on their no. 23294, and "white with tiny yellow eye" on Anderson & al. 35351.

Additional citations: BRAZIL: Maranhão: Eiten & Eiten 4162a (N). Minas Gerais: Anderson, Stieber, & Kirkbride 35351 (Ld, N, W--2709311); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28042 (Ld); Irwin, Reis dos Santos, Souza, & Fonsêca 21991 (Ld, N), 23294 (Ac, N).

LIPPIA CARDIOSTEGIA Benth.

Additional bibliography: Moldenke, Phytologia 14: 405. 1967; Moldenke, Résumé Suppl. 16: 3 (1968) and 17: 2. 1968; A. L. Moldenke, Phytologia 18: 122. 1969; Gibson, Fieldiana Bot. 24 (9): 208--209. 1970; Lowden, Taxon 19: 21 & 31. 1970; Moldenke, Fifth Summ. 1: 71, 80, 83, 85, 86, 88, & 91 (1971) and 2: 551 & 890. 1971; Moldenke, Phytologia 23: 415 & 416. 1972; Rouleau, Taxon Index Vols. 1-20, part 1: 216. 1972; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 67, 69, & 146. 1973; Moldenke, Phytologia 28: 432 & 433. 1974; Molina R., Ceiba 19: 96. 1975; Moldenke, Phytologia 38: 398. 1978.

Gibson (1970) reduces L. lucens Standl. and L. hypoleia var. ovatifolia Moldenke to synonymy here and lists the common names, "chiliqua", "coronchoch", and "vara fina". She gives its distribution as "Damp or dry, often rocky, brushy plains and hillsides, sometimes in open, mixed forest, 150--1,500 meters; Alta Verapaz; Chimaltenango; Chiquimula; Escuintla; Guatemala; Huehuetenango; Jutiapa; El Quiché; Sacatepéquez; Santa Rosa. Southern Mexico; El Salvador; Honduras; Nicaragua; Costa Rica." She comments that "This species is extremely variable, especially in leaf size and length of peduncles, but there seem to be no definite characters by which the various forms can be separated. One specimen, Steyermark 31596, is atypical because of its relatively narrow, oblanceolate to elliptic-oblong leaves." She cites Molina R. 1456, 1837, & 3213, P. C. Standley 26473, and Williams & Molina R. 10802, regarded as L. lucens Standl. by me.

Recent collectors describe what I regard as true L. cardiostegia as a "woody herb", 1--1.5 m. tall, a small weak shrub, 0.5--4 m. tall, or even as a tree, 4--5 m. tall, the trunk 2--3 cm. in diameter. They have encountered it in secondgrowth, on farmlands, in volcanic clinkers, in areas of mixed forests and clearings, in wet "matorrales", in somewhat disturbed soil, and on cutover hills often with low or scrub forest, at altitudes of 5--1700 meters, flowering in March, August, and from October to January, fruiting from September to March. Laughlin found it "on shrubby slopes with Quercus, Hauya, Bursera, and Heliocarpus"; Harmon & Dwyer "in good stand of pines with oaks and more mesic draws"; and Breedlove "on slopes with scrubby secondgrowth of Solanum, Ficus, Randia, Byrsonima, and Verbesina". Jiménez says "creciendo al sol en barranco con poca vegetación". Heithaus reports it "uncommon" in disturbed areas and Frankie found it "not common". On the other hand, Wilbur & Stone report it "common" on dry, open, wooded slopes and the Molinas report it "common" or "frequent" on dry steep slopes, in mixed moist forests, and in dry or wet thickets and riverine thickets. Neill encountered it in deciduous tropical forests, while Hall & Bockus refer to it as a "bog shrub" growing in sunny spots near outcrops of basalt rock.

The corollas are said to have been "white" on Breedlove 20304, Heithaus 474, and Laughlin 2153, "cream" on Molina R. 13106, 13556, 21989, & 22062, "cream, yellow in center" on Jiménez M. 1576, "blancas con boca amarilla" on Jiménez M. 4183, "greenish-yellow" on Molina R. & Molina 24585, "pale-yellow" on Molina R. 21450 and Williams & al. 40076, "yellow" on White & White 103, and "yellow or white" on Frankie 319a.

Davis (1910) and Lowden (1970) report the species as infested by the fungus, Cercospora cardiostegiae Davis.

Material of L. cardiostegia has been misidentified and distributed in some herbaria as L. asperifolia Rich., L. brenesii Standl., L. myriocephala Schlecht. & Cham., and even as Cordia polycephala (Lam.) I. M. Johnst. On the other hand, the Harmon & Dwyer 3076,

distributed as L. cardiostegia, is actually L. chiapasensis Loes., Molina R. & Molina 24429 is L. controversa Moldenke, McCaffrey DMC.39 is L. costaricensis Moldenke, and Molina R. 13498 is L. substrigosa Turcz.

Additional citations: MEXICO: Chiapas: Breedlove 12098 (Ld), 13921 (Ld), 14946 (Ld), 20304 (N), 23339 (Ld), 27267 (Ld); Breedlove & Thorne 21308 (Ld); Laughlin 2153 (Ld); F. Miranda 5565 (W-2508368). GUATEMALA: Alta Verapaz: Williams, Molina R., Williams, & Molina 40076 (N). Chiquimula: Harmon & Dwyer 3715 (N, W-2705580); Molina R. & Molina 25343 (Ld). Santa Rosa: Heyde & Lux 4385 (Mu-3824). HONDURAS: Choluteca: Molina R. 1310 (N); Molina R. & Molina 24585 (N). Copán: Molina R. & Molina 24696 (Ld). Intibucá: Molina R. & Molina 25530 (N). Lampira: Hazlett 775 (E-2162955). Santa Bárbara: Molina R. 21989 (N), 22062 (N). EL SALVADOR: La Libertad: Molina R. 21450 (N). Sonsonate: Molina R. & Montalvo 21698 (N). NICARAGUA: Estelí: Molina R. 23049 (N); Williams & Molina R. 42384 (W-2734849). Granada: E. B. Nelson 7510 (Bm); F. C. Seymour 7510 (N). León: Hamblett, Nichols, & Dudley 219 (E-2134858). Managua: Atwood 2823 (E-2134856); Neill 758 [7980] (Z). Masaya: Hall & Bockus 7889 (Ld, N); F. C. Seymour 3319 (E-2134857). COSTA RICA: Alajuela: Molina R. 13556 (W-2568207); Wilbur & Stone 9912 (N). Cafiás: Frankie 319a (E-2121502). Cartago: Pittier 2519 [Herb. Nat. Costaric. 13215] (Mu-3825). Guanacaste: Heithaus 474 (N); Jiménez M. 1576 (N, W-2751893, Ws, Ws), 4183 (N). San José: J. Taylor 17303 (N, W-2770894); Tonduz & Biolley 7218 (Mu-3781). PANAMA: Chiriquí: White & White 103 (E-1176346).

LIPPIA CARVIODORA Meikle

Additional bibliography: Cosgrove & al., Colonial Pl. & Animal Prod. Gt. Brit. 1: 56-62. 1950; Cosgrove & al., Chem. Abstr. 44: 11033. 1950; Islip & Matthews, Colonial Pl. & Animal Prod. Gt. Brit. 2: 96-101. 1951; Islip & Matthews, Chem. Abstr. 48: 6073. 1954; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14357. 1958; Dale & Greenway, Kenya Trees 588. 1961; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. & East Afr., ed. 2, 1051 & 1410. 1962; Hirata, Host Range & Geogr. Distrib. Powd. Mild. 276. 1966; Moldenke, Phytologia 14: 405. 1967; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 264. 1969; Moldenke, Fifth Summ. 1: 241 (1971) and 2: 890. 1971; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 668. 1973.

Cosgrove and his associates (1950) have isolated aldehydes, ketones, and esters in volatile oil from the flowers of this plant; Islip & Matthews (1951) found d-limonene in volatile oil in the leaves. Watt & Breyer-Brandwijk (1962) summarize the situation as follows: "Material of Lippia carviadora Meikle from Kenya and Somaliland has been investigated for its volatile oil content.....Kenya.....material yields 1 percent from the flower

head and from the leaf. The oil contains 60 per cent of aldehydes and ketones mainly as d-carvone. Dry leaf from Somaliland.. yields volatile oil to the extent of 3.15 per cent from flower-head and 0.99 per cent from leaf and twig."

Hirata (1966) records a species of the powdery mildew genus Leveillula as infesting the plant in Kenya.

LIPPIA CARVIODORA var. **MINOR** Meikle

Additional bibliography: Moldenke, *Phytologia* 12: 118. 1965; Moldenke, *Fifth Summ.* 1: 213 & 241 (1971) and 2: 541, 542, & 890. 1971.

LIPPIA CENTAUREA A. Chiov.

Additional bibliography: Moldenke, *Phytologia* 12: 118—119. 1965; Moldenke, *Fifth Summ.* 1: 227 (1971) and 2: 890. 1971.

LIPPIA CHACENSIS Moldenke

This taxon is now regarded as conspecific with L. lorentzii Moldenke, which see.

LIPPIA CHEVALIERII Moldenke

Synonymy: Lippia chevalieri Moldenke apud Meikle in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 437. 1963.

Additional & emended bibliography: Meikle in Hutchinson & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 432, 436, & 437. 1963; Meikle, *Kew Bull.* 17: 174. 1963; Townsend, *Excerpt. Bot. A.* 7: 364. 1964; Berhaut, *Fl. Sénégal*, ed. 2, 153 & 167. 1967; Hocking, *Excerpt. Bot. A.* 10: 271. 1967; Kerharo, *Bull. Inst. Fond. Afr. Noire A.* 29: 1416, 1421, 1424, & 1429. 1967; Moldenke, *Phytologia* 14: 405. 1967; Moldenke, *Résumé Suppl.* 15: 6 & 7 (1967) and 16: 23. 1968; Adam, *Adansonia*, ser. 2, 8: 454. 1968; Adam, *Journ. Agr. Trop. & Bot. Appl.* 17: 289. 1970; Moldenke, *Fifth Summ.* 1: 210, 215—218, & 222 (1971) and 2: 552 & 890. 1971; Moldenke, *Phytologia* 38: 263 & 264. 1978.

Meikle (1963) gives in synonymy for this species: "L. adoensis of F. T. A. 5: 280, partly; F. W. T. A., ed. 1, 2: 270, partly, not of Hochst." and avers that it is related to L. savoryi Meikle. He keys out the related species as follows:

1. Flower-heads in spreading, much-branched corymbose cymes.
2. Upper leaf-surface smooth to touch, the venation obscure; stems subglabrous or sparsely appressed-pubescent; floral bracts very obtuse at the apex, shortly mucronate.....
L. multiflora.
- 2a. Upper leaf-surface rough to touch, the venation prominently rugose-reticulate; stems usually distinctly appressed-pubescent; floral bracts acute or cuspidate at the apex.....
L. rugosa.
- 1a. Floral-heads in narrow, elongated terminal and axillary whorls or spikes.
3. Floral bracts obtuse or short-cuspidate; leaves smooth or slightly scabridulous; stems subglabrous or sparsely appres-

sed-pubescent.....L. chevalierii.

3a. Floral bracts acute; leaves strongly scabrid; stems densely pubescent or pilose.....L. savoryi.

Adam (1968) notes that L. chevalierii is a "producteur possible de camphre....Plantes suffrutescentes recherchent les lieux les plus pauvres et recailleux." Common names recorded for it in Sénégal are "baé-bae", "balath", "borgal", "brégé", "dut", "gagorènt", "gâporèmp", "mbalat", "mbormbor", "sufuhô", and "wusuné koloma". According to Kerharo (1967) the name, "thé de Gambie", is applied to this species and also to L. abyssinica (Otto & Dietr.) Cuf. in Sénégal. Berhaut (1967) also records that name for L. chevalierii, but records, in addition, "bu sāg", "ganéka", and "mbalhat". He cites his no. 805 from Sénégal.

LIPPIA CHIAPASENSIS Loes.

Additional & emended bibliography: Loes., Verh. Bot. Ver. Brand. 53: 78--79 [Abhandl. 241]. 1912; Moldenke, Phytologia 14: 405. 1967; Moldenke, Résumé Suppl. 16: 23. 1968; Uphof, Dict. Econ. Pl., ed. 12, 315. 1968; Gibson, Fieldiana Bot. 24 (9): 207 & 209--210. 1970; Moldenke, Fifth Summ. 1: 71 & 80 (1971) and 2: 552 & 890. 1971; Moldenke, Phytologia 23: 415 (1972) and 28: 432. 1974.

Recent collectors describe this plant as a shrub, 1--2 m. tall, or a tree, 4 m. tall. They have found it growing on open limestone, in pine forests, on shrubby slopes, rocky hills in pine-oak forests, slopes with Pinus, Saurauia, Dodonaea, and Hauya, grassy slopes with Quercus or with Pinus and Quercus, and on slopes with Pinus, Quercus, Arbutus, and Juniperus, in ravines, and along roadsides in the dry mountain forest zone. Gibson (1970) says that it is found in "Wet or dry often rocky thickets or forests, frequently in pine-oak forests, sometimes in meadows". Breedlove & Thorne encountered it on dry slopes with Ficus, Hauya, Heliocarpus, Ipomoea, Quercus, and Juniperus. It has been found at altitudes of 1300--3000 m., in flower in January, March, April, July, and December and in fruit in March, April, and from November to January. The corollas are said to have been "white" on Laughlin 2714 & 2981 and "yellow turning cream" on Proctor 25324.

Uphof (1968) reduces L. chiapasensis to synonymy under L. umbellata Cav., but Gibson (1970) not only maintains it but reduces L. curtisiana Moldenke to its synonymy. She records it from Mexico and from Baja Verapaz, Huehuetenango, San Marcos, Sololá, and Totonicapán in Guatemala. She comments that "Although this plant has smaller flowering heads and generally smaller leaves than L. substrigosa Turcz., they appear to be closely related."

Material of L. chiapasensis has been misidentified and distributed in some herbaria as L. cardiostegia Benth. and even cited by me (1965) as L. curtisiana Moldenke. On the other hand, the Laughlin 400 and the Williams, Molina R., Williams, & Molina 40549, distributed as L. chiapasensis, are actually L. controversa Moldenke.

Additional & emended citations: MEXICO: Chiapas: Breedlove 9485 (Ld), 14073 (Ld), 15642 (M1, N), 15652 (Ld); Breedlove & Dressler 29502 (N); Breedlove & Thorne 21323 (Ld, N); R. M. Laughlin 475 (W—2544426), 2714 (N, W—2556915), 2981 (W—2556821); F. Miranda 5012 (W—2508292), 5824 (W—2508298); Ton 1463 (N), 1473 (M1), 1838 (Ld, W—2556705). GUATEMALA: Baja Verapaz: P. C. Standley 91197 (N). El Quiché: Proctor 25324 (Ld, Ld). Guatemala: Harmon & Dwyer 3076 (W—2705608). Huehuetenango: P. C. Standley 82044 (N). Sololá: Williams, Molina R., & Williams 23203 (N). Totonicapán: P. C. Standley 84076 (N).

LIPPIA CHRYSANTHA Greerm.

Additional bibliography: Moldenke, *Phytologia* 14: 405. 1967; Moldenke, *Fifth Summ.* 1: 71 (1971) and 2: 890. 1971.

The Lundells describe this species as a shrubby plant, the corolla-lobes white and the tube dark-yellow. Loesener (1912) cites Seler 2023 from "in planitie silva alta" in Oaxaca, the corolla yellow, flowering in February. He comments that "Die Art dürfte in die Gruppe Corymbosae (Schauer) Briq. zu stellen sein".

The Purpus 10519, distributed as L. chrysantha, actually is the type collection of Aloysia chiapensis Moldenke.

Additional citations: MEXICO: Morelos: Lundell & Lundell 12507 (M1); Pringle 8679 (Mu—3988—isotype, Mu—4199—isotype).

LIPPIA CIPOENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 351. 1966; G. Taylor, *Ind. Kew. Suppl.* 13: 81. 1966; Moldenke, *Fifth Summ.* 1: 155 (1971) and 2: 890. 1971.

LIPPIA CONTERMINA Briq.

Additional & emended bibliography: Briq. in Chod. & Hassl., *Bull. Herb. Boiss.*, ser. 2, 4: 1157—1158. 1904; Briq. in Chod. & Hassl., *Pl. Hassler.* 2: 493—494. 1904; Burkart, *Excerpt. Bot. A.* 5: 585. 1962; Moldenke, *Phytologia* 13: 351. 1966; Moldenke, *Fifth Summ.* 1: 186 & 198 (1971) and 2: 567 & 890. 1971; Troncoso, *Darwiniana* 18: 340 & 410. 1974; Moldenke, *Phytologia* 38: 263. 1978.

LIPPIA CONTROVERSA Moldenke

Additional bibliography: Moldenke, *Phytologia* 14: 405—406. 1967; Gibson, *Fieldiana Bot.* 24 (9): 208 & 210. 1970; Moldenke, *Fifth Summ.* 1: 72, 80, 83, & 88 (1971) and 2: 563 & 890. 1971; Moldenke, *Phytologia* 25: 227 (1973) and 28: 433. 1974; Molina R., *Ceiba* 19: 96. 1975; Moldenke, *Phytologia* 34: 251 & 253. 1976.

Recent collectors describe this plant as an erect woody "herb", 1.5 m. tall, or an aromatic shrub, 1—4 m. tall, the leaves dark-green above, light-green beneath, and the inflorescence bracts pale-green. They have encountered it on valley floors, in open areas in forests, in moist thickets and wet mixed forests, on moist banks in mixed forests, and on gentle slopes with tropical deciduous forests of Bursera, Ceiba, and Heliocarpus, at altitudes

of 150—2250 meters. Standley refers to it as "occasional" and Heithaus as "uncommon", but the Molinas found it to be "frequent".

It has been found in anthesis from October to March and in fruit from November to March. The corollas are said to have been "cream" colored on Molina 13054, "pale-yellow" on McKee 11193, and "yellow" on Breedlove 20375, Laughlin 400, Molina 13219, and Williams & al. 26440 & 40540.

Gibson (1970) has reduced L. controversa var. brevipedunculata Moldenke to synonymy here. Material of L. controversa has been misidentified and distributed in some herbaria as L. chiapasensis Loes., L. lucens Standl., and L. oxyphyllaria (Donn. Sm.) Standl. On the other hand, the Williams, Molina R., & Williams 26440, distributed as L. controversa, actually is L. liberiensis Moldenke.

Additional citations: MEXICO: Chiapas: Breedlove 20375 (Ld, N), 28294 (Ld); R. M. Laughlin 400 (Ws). GUATEMALA: Alta Verapaz: Williams, Molina R., Williams, & Molina 40540 (N). Santa Rosa: Heyde & Lux 4387 (Mu). HONDURAS: Choluteca: Molina R. 13054 (Ld, N). El Paraíso: Molina R. 13219 (Ld, N, W--2568370). Intibucá: Molina R. & Molina 24429 (N). Morazán: P. C. Standley 13668 (N). COSTA RICA: Alajuela: McKee 11193 (P). Guanacaste: Heithaus 486 (E--2156239); Williams, Molina R., & Williams 26440 (W--2751895).

LIPPIA CONTROVERSA var. BREVIPEUNCULATA Moldenke

Additional bibliography: Moldenke, *Phytologia* 12: 138. 1965; Gibson, *Fieldiana Bot.* 24 (9): 210. 1970; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 890. 1971; Moldenke, *Phytologia* 34: 251 & 253. 1976.

Collectors describe this plant as a bush, 1 m. tall, and have found it in flower in May and December. Grashoff refers to it as "frequent" and with "yellow" corollas. Gibson (1970) reduces it to synonymy under typical L. controversa.

Additional citations: MEXICO: Oaxaca: Grashoff 229 (Ln--221668). NICARAGUA: Granada: Atwood A.202 (Ln).

LIPPIA CORIACEA Briq.

Additional bibliography: Burkart, *Excerpt. Bot.* A.5: 585. 1962; Moldenke, *Phytologia* 13: 351. 1966; Moldenke, *Fifth Summ.* 1: 186 (1971) and 2: 553 & 891. 1971; Troncoso, *Darwiniana* 18: 340 & 412. 1974.

LIPPIA CORYMBOSA Cham.

Additional synonymy: Lippia corymbosa Troncoso, *Darwiniana* 18: 412, sphalm. 1974.

Additional bibliography: Buek, *Gen. Spec. Syn.* Candoll. 3: 266. 1858; Moldenke, *Phytologia* 13: 351. 1966; Moldenke, *Fifth Summ.* 1: 155 (1971) and 2: 560 & 891. 1971; Troncoso, *Darwiniana* 18: 338 & 408--412. 1974; Moldenke, *Phytologia* 36: 44. 1977.

Recent collectors describe this species as an "herb, somewhat woody at base", as a viscous shrub, or as an ascending subshrub, 1--

2 m. tall, brittle and few-branched, or even as a perennial herb, 50 cm. tall, with few stems, the stems 0.75--1 m. tall, the leaves dark-green and aromatic, the flower-heads magenta, and the bracts rose-color, rose-violet, red-violet, or lavender-pink. They have found it growing in cerrado and on cerrado slopes, on steep sandstone slopes, in sandy soil, in open woods on rocky slopes, and along streams, at altitudes of 1000--1600 m., flowering from December to April, and in fruit in February. The corollas are said to have been "pink" on Harley & Lima 11495 and on Irwin & al. 19275, "pinkish-lavender" on Irwin & al. 28507, "lavender-pink" on Anderson 6459, "pinkish-magenta" on Irwin & al. 34135, "purple-pink" on Anderson 8843, "rose-pink, throat yellow" on Irwin & al. 32790, "magenta" on Irwin & al. 27508, "lilac" on Hatschbach & Ahumada 31643, "rose" on Giulietti & Lima 739, and "red-violet, tube white" on Irwin & al. 12847.

Anderson encountered the species "on rocky hillsides in region of rocky sandstone hilltop cerrado, seeping hillsides, rocky open cerrado in raised places on hillsides, and open mesophytic woods by stream". Irwin and his associates found it "occasional on rocky slopes and creek margins", "on outcrops in area of cerrado on steep slopes surrounded by campo", "on outcrops in area of campo on white sand and cerrado among outcrops", and "on brown sandy soil of cerrado".

Troncoso (1974) refers to L. corymbosa as the lectotype species of the Series Corymbosae Schau. and Subseries Corymbosae (Schau.) Briq., defined as characterized by "Cabezuelas subespiciformes o racemosas, laxas, corimboso-paniculadas".

The Martius s.n. [in campis aridiusculis ad S. de S. Anto. Jul.], distributed as L. corymbosa, actually is L. gardneriana Schau.

Additional citations: BRAZIL: Goiás: W. R. Anderson 6459 (Ld, N); Giulietti & Lima 739 (Z); Harley & Lima 11495 (N); Irwin, Anderson, Stieber, & Lee 34135 (N); Irwin, Grear, Souza, & Reis dos Santos 12847 (Ac, N); Irwin, Harley, & Smith 32790 (Ld, Ld, N, W--2709806), 32082 (Ac, W--2709879), 32808 (N); Irwin, Maxwell, & Wasshausen 19275 (Ld). Minas Gerais: W. R. Anderson 8843 (N); Hatschbach & Ahumada 31643 (Ac, Ld, W--2706100); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27508 (Ac), 28507 (Ld); Martius 1035 (Mu--34). State undetermined: Irwin & al. s.n. (N, N).

LIPPIA COSTARICENSIS Moldenke

Additional bibliography: Arthur, Mycologia 10: 133--134. 1918; Moldenke, Phytologia 13: 351. 1966; A. L. Moldenke, Phytologia 18: 123. 1969; Moldenke, Fifth Summ. 1: 88 & 91 (1971) and 2: 891. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 67, 71--72, & 146. 1973; Moldenke, Phytologia 34: 253. 1976.

Recent collectors describe this species as a shrub or tree, 4--12 m. tall, the trunk 8--36 cm. in diameter, the smaller branches square, the wood white, and the leaves rugose, slightly scabrous, with a strong, pleasant, mint-like aroma. They have found it

growing on slopes and in primary and cloud forests, at altitudes of 900—2333 meters, flowering in June and November, and in fruit in August. The corollas are said to have been "yellow" on Lent 2633.

Material of this species has been misidentified and distributed in some herbaria as L. brenesii Standl., L. myriocephala Schlecht. & Cham., and L. torresii Standl.

Additional citations: COSTA RICA: Heredia: Lent 721 (Ld), 2633 (N). San José: McCaffrey DMC.39 (N). PANAMA: Chiriquí: Kirkbride 143 (N); Stern & Chambers 88 [Yale wood no. 51599] (E—1739967).

LIPPIA CULMENICOLA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.11: 505. 1967; Moldenke, Phytologia 14: 406. 1967; Moldenke, Biol. Abstr. 49: 2769. 1968; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 891. 1971; Heslop-Harrison, Ind. Kew. Suppl. 15: 80. 1974.

Additional citations: MEXICO: Jalisco: R. McVaugh 23036 (Ip—istotype).

LIPPIA CURTISIANA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 352. 1966; Gibson, Fieldiana Bot. 24 (9): 209. 1970; Moldenke, Fifth Summ. 1: 72 & 80 (1971) and 2: 891. 1971; Moldenke, Phytologia 23: 415 (1972) and 34: 251. 1976.

Recent collectors have found this plant growing in "lower chaparral with Acacia, Bernardia, Mimosa, Mortonia, Bouvardia, Dasyliiron, Cordia, Opuntia, Eysenhardtia, etc." and "in matorral espinosa lateral, chaparral on higher slopes, steep to very steep slopes of limestone in places higher up mineralized, calcareous soil, with Acacia berlandieri, A. crassifolia, Fouquieria, higher up with Quercus" and describe it as a "common rounded shrub". They have encountered it at 1800—3138 m. altitude, in flower and fruit in September. The corollas are said to have been "light-yellow" on Henrickson 13248.

Gibson (1970) reduces L. curtisiana to synonymy under L. chiapasensis Loes. Material of L. curtisiana has been misidentified and distributed in some herbaria as Cordia sp. On the other hand, the P. C. Standley 82044, 84076, & 91197, distributed as and previously cited by me (1965) as L. curtisiana, as well as Williams, Molina R., & Williams 23203, are actually L. chiapasensis Loes.

Additional citations: MEXICO: Coahuila: Chiang, Wendt, & Johnston 9547a (Ld); Henrickson 13248 (Ld). Durango: K. Reiche 782 (Mu).

LIPPIA DAUENSIS (Chiov.) Chiov.

Additional synonymy: Lippia dauensis Chiov. apud Fedde & Schust. in Just, Bot. Jahresber. 60 (2): 574. 1941.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 60 (2): 574. 1941; Glover, Prov. Check List Brit. & Ital.

Somal. 268. 1947; Dale & Greenway, Kenya Trees 588. 1961; Moldenke, Phytologia 12: 143--144. 1965; Moldenke, Fifth Summ. 1: 212, 213, & 241 (1971) and 2: 538, 554, & 811. 1971; Moldenke, Phytologia 25: 240. 1973.

Chiovenda (1932) cites Scasellati 2 & Senni 13644 from Somalia.

LIPPIA DIAMANTINENSIS Glaz.

Additional bibliography: Moldenke, Phytologia 13: 352. 1966.

LIPPIA DOMINGENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 14: 406. 1967; Moldenke, Fifth Summ. 1: 103 (1971) and 2: 891. 1971.

Recent collectors describe this plant as a woody shrub, 1 m. tall, much-branched and aromatic, the branches spreading and flexuous. The corollas are uniformly referred to as "white" on the four Liogier collections cited below. The species has been found growing commonly on limestone rocks, on bauxite, and in pine-lands on limestone and bauxite, at altitudes of 800--1300 meters, flowering in February, March, and July, and fruiting in March and July.

Material of this species has been misidentified and distributed in some herbaria as Lantana exarata Urb. & Ekm. or as Lantana sp.

Additional citations: HISPANIOLA: Dominican Republic: J. J. Jiménez 4469 (N); A. Liogier 13666 (N, Z), 13811 (Ac, N), 17922 (N); Liogier & Liogier 19656 (N).

LIPPIA DRACOCEPHALOIDES Turcz.

This taxon is now considered to be conspecific and synonymous with L. eupatorium Schau., which see.

LIPPIA DUARTII Moldenke

Additional bibliography: J. A. Clark, Card-Ind. Gen. Sp. Var. Pl. issue 245. 1965; Schubert, Assoc. Trop. Biol. Bull. 4: 73. 1965; Moldenke, Phytologia 13: 352. 1966; G. Taylor, Ind. Kew. Suppl. 14: 79. 1970; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971.

LIPPIA DUMETORUM Herzog

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 254. 1922; R. C. Foster, Contrib. Gray. Herb. 184: 170. 1958; Moldenke, Phytologia 13: 352. 1966; Moldenke, Résumé Suppl. 15: 5. 1967; Moldenke, Phytologia 25: 230. 1973; Moldenke, Fifth Summ. 1: 183 (1971) and 2: 891. 1971; Troncoso, Darwiniana 18: 337 & 410. 1974.

Recent collectors describe this plant as an herb or slender aromatic shrub, 0.5--1.5 m. tall, and have encountered it at 500--1250 meters altitude, flowering in May, June, and September. Fosberg reports it "common" in low brush in dry secondgrowth with open, severely burned, grassy areas on slopes and crests, while Steinbach found it "rather frequent" on slopes of wet woodland hillsides. The corollas are said to have been "white" on Fosberg

28603, "greenish-white" on Krapovickas & al. 19169, "creamy-white, yellow in inner center" on Steinbach 333. The last-mentioned collector also notes "caliz verde claro fel oso".

Material of L. dumetorum has been misidentified and distributed in some herbaria as L. origanoides H.B.K., a closely related species of northern South America.

Additional citations: BOLIVIA: Santa Cruz: F. R. Fosberg 28603 (Ld); R. F. Steinbach 333 (N, S, Ut—328761B, W—2533284, Z). Tarija: Krapovickas, Mroginsky, & Fernández 19169 (Ws).

LIPPIA DURANGENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 352. 1966; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 554, 563, & 891. 1971.

LIPPIA EKMANI Moldenke

Synonymy: Lippia ekmanii Moldenke, *Fifth Summ.* 2: 554. in syn. 1971.

Additional bibliography: Moldenke, *Phytologia* 13: 352. 1966; Moldenke, *Résumé Suppl.* 16: 24. 1968; Moldenke, *Fifth Summ.* 1: 155 & 198 (1971) and 2: 554 & 891. 1971; Troncoso, *Darwiniana* 18: 337 & 410. 1974; Moldenke, *Phytologia* 34: 260. 1976.

Recent collectors have found this plant "en bajo pantanoso", "com xilopódio, invasora de lavoura de soja", and on campos. The corollas are said to have been "white" on Krapovickas & al. 15185 and on Schinini & Carnevali 10302. It has been found in anthesis in April and November and in fruit in April.

Additional citations: BRAZIL: Rio Grande do Sul: Irgang ICN. 9797 (Ut—320446); Pivetta 1157 [*Herb. Anchieta* 61369] (B). ARGENTINA: Corrientes: Schinini & Carnevali 10302 (Ld). Misiones: Krapovickas, Cristóbal, Maruñak, Pire, & Tressens 15185 (Z).

LIPPIA ELEGANS Cham.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Moldenke, *Phytologia* 13: 352. 1966; Anon., *Biol. Abstr.* 51 (16): B.A.S.I.C. S.126. 1970; Moldenke, *Biol. Abstr.* 51: 9025. 1970; Angely, *Fl. Anal. & Fitogeogr. Est. S. Paulo*, ed. 1, 4: 835 & xi, map 1385. 1971; Moldenke, *Fifth Summ.* 1: 155 (1971) and 2: 891. 1971.

Recent collectors describe this species as a broad-crowned shrub or subshrub, 0.5—3 m. tall, or the stems to 3 m. long and leaning on forest shrubs. They have found it growing in cerrado, among boulders on slopes, on "campo cerrado" at the edge of "despada", in mesophytic woods with cerrado on upper drier slopes, in gallery margins in areas of gallery forests and adjacent cerrado, areas of wooded creek margins and cutover cerrado, and areas of cerrado and gallery woods in steep rocky gorges, also in campo thickets in areas of disturbed slope forests and adjacent rocky campo, at altitudes of 650—1200 meters, flowering in February, March, May, and June. Hatschbach encountered it in "cerrado solo pedregoso, borda da serra". The corollas are said to have been "white" on

Anderson 7341, Irwin & al. 12462, 24817, & 27193, Murça Pires 58039, and Trinta 646, "white, throat yellow" on Irwin & al. 31842, "white, tube pink at base outside" on Irwin & al. 20825, "cream" on Hatschbach 34152, and "whitish, inside of tube yellow" on Hatschbach 31946. The leaves on P. Clausen s.n., cited below, are much smaller and more abundant than seen on most other material of this species.

The Angely (1971) reference in the bibliography above is sometimes cited by its titlepage date of "1970", but was not actually issued until 1971.

Material of L. elegans has been misidentified and distributed in some herbaria as L. sidoides Cham.

Additional citations: BRAZIL: Goiás: W. R. Anderson 7341 (Ld, N); Irwin, Grear, Souza, & Reis dos Santos 12462 (Ac, N); Irwin, Harley, & Smith 31842 (Ld, Ld, N, W—2709632); Irwin, Reis dos Santos, Souza, & Fonsêca 24817 (Ld, N), 24446 (Ac, N). Mato Grosso: Hatschbach 31946 (Ld, N, W—2744571), 34152 (Ld). Minas Gerais: A. Castellanos 25407 [Herb. FEEMA 4215] (Ld); P. Clausen s.n. [Aug.—April 1840] (Mu—4313); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27193 (Ld); Irwin, Maxwell, & Wasshausen 20825 (Ld, N); Murça Pires 58039 (W—2571102A); Trinta 646 [Fromm 1722; Herb. Brad. 29811] (N). State undetermined: Martius 1037 (Mu—110, Mu—1213, Z).

LIPPIA ELEGANS var. OBTUSIFOLIA Moldenke, Phytologia 19: 319. 1970.

Bibliography: Anon., Biol. Abstr. 51 (16): B.A.S.I.C. S.126. 1970; Moldenke, Biol. Abstr. 51: 9025. 1970; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971.

Citations: BRAZIL: Goiás: Barrosa, Lima, & Lima 568 (N—type).

LIPPIA ELLIPTICA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 13: 353. 1966; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971; Troncoso, Darwiniana 18: 339 & 410. 1974; Moldenke, Phytologia 31: 384 (1975) and 36: 34. 1977.

The Duarte 7850 [Herb. Brad. 27897], previously cited by me (1965) as L. elliptica, actually is now the type collection of L. bradeana Moldenke.

LIPPIA ELLIPTICA var. SILVICOLA Moldenke, Phytologia 31: 230—231. 1975.

Bibliography: Moldenke, Phytologia 31: 230—231 & 384. 1975.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16436 (Z—type).

LIPPIA EUPATORIUM Schau.

Synonymy: Lippia dracocephaloides Turcz., Bull. Soc. Nat. Mosc. 36 (2): 205. 1863. Lippia dracocephaloides DC. ex Moldenke, Fifth Summ. 2: 553, in syn. 1971.

Additional & emended bibliography: Buek, Gen. Spec. Syn. Can. dol. 3: 266. 1858; Turcz., Bull. Soc. Nat. Mosc. 36 (2): 205. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 95 (1894) and imp. 2, 2: 95. 1946; Moldenke, Alph. List Cit. 1: 223 (1946) and 3: 692 & 695. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 80, 189, & 190. 1949; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 95. 1960; Moldenke, Résumé Suppl. 8: 2 & 4. 1964; Moldenke, Phytologia 12: 24, 146—147, & 153—154 (1965) and 13: 352. 1966; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Anon., Biol. Abstr. 52 (18): B.A.S.I.C. S.146. 1971; Moldenke, Biol. Abstr. 52: 9943. 1971; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 553, 554, & 891. 1971; Moldenke, Phytologia 25: 229. 1973; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Troncoso, Darwiniana 18: 339 & 410. 1974.

Recent collectors describe this plant as an erect, few-branched, often nearly defoliated shrub or subshrub, 0.75—1 m. tall, the bracts light-violet, and the fruit yellow-green. They have encountered it in cerrado or rocky campo, or in sandy soil of rocky cerrado in areas of gallery forest, adjacent brejo, and drier higher slopes with grassy campo or rocky cerrado. Irwin and his associates refer to it as "occasional" on steep campo slopes, while Hatschbach found it in "cerrado encosta rochosa de morro". It has been found growing at altitudes of 700—1230 meters, flowering in May and September, and fruiting in February and September. The corollas are said to have been "yellow" on Anderson 10426 and on Hatschbach 36696 & 36899.

The Pohl s.n., distributed as L. eupatorium, actually is L. bradeana var. velutina Moldenke. Lippia dracocephaloides is based on G. Gardner 4334 from Goiás, Brazil.

Additional & emended citations: BRAZIL: Distrito Federal: Hatschbach 36696 (Ac); Héringer 8939/1133 (N); Irwin & Soderstrom 6249 (N). Goiás: W. R. Anderson 10426 (N, Z); G. Gardner 4334 [Macbride photos 24648] (It—photo, Kr—photo, N, N—photo, W—photo); Hatschbach 36899 (Ld). Minas Gerais: Irwin, Onishi, Fonseca, Souza, Reis dos Santos, & Ramos 26221 (N).

LIPPIA EUPATORIUM var. ANGUSTIFOLIA Moldenke, Phytologia 21: 253. 1971.

Bibliography: Anon., Biol. Abstr. 52 (18): B.A.S.I.C. S.146. 1971; Moldenke, Biol. Abstr. 52: 9943. 1971; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971; Moldenke, Phytologia 21: 253 (1971) and 25: 229. 1973.

Collectors describe this plant as a slender, ascending or erect, nearly defoliated subshrub, with a single stem from a perennial base, 0.75—1 m. tall, the inflorescences rigidly nodding or pendent, the bracts light-violet, and the corollas yellow. They have encountered it on campos in areas of dense cerrado on hillsides and adjacent "campo limpo", on campos in areas of campo and cerrado, and "occasional" on steep campo slopes bordering gallery forests, at altitudes of 700—1100 meters, flowering in March.

Material of this variety has been distributed in some herbaria as L. dracocephaloides Turcz.

Citations: BRAZIL: Distrito Federal: Irwin & Soderstrom 6249 (N); Murça Pires, Silva, & Souza 9652 (Z—type). Goiás: W. R. Anderson 7683 (Ub); Irwin, Harley, & Smith 32005 (Ld, N, W--2709296).

LIPPIA FELIPPEI Moldenke

Additional bibliography: Schubert, Assoc. Trop. Biol. Bull. 4: 73. 1965; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl. issue 245. 1965; Moldenke, Phytologia 13: 353. 1966; G. Taylor, Ind. Kew. Suppl. 14: 79. 1970; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971.

Hatschbach describes this plant as erect, 50 cm. tall, with rose-colored flowers (corollas? or bracts?), and encountered it in cerrado, flowering in July.

Additional citations: BRAZIL: Minas Gerais: Hatschbach 34563 (Ld); Laroça 30 (Z).

LIPPIA FERRUGINEA H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 215. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 215 (1817) and ed. quarto, 2: 265—266. 1818; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 645, 649, & 654. 1960; Moldenke, Phytologia 14: 406. 1967; Moldenke, Fifth Summ. 1: 142 (1971) and 2: 549, 554, 568, & 891. 1971; Soukup, Biota 11: 14. 1976.

Recent collectors report that this species is common on steep, dry slopes, in reddish soil, with cacti and sparse brush, badly grazed by goats, at 1740—1800 m. altitude, and describe it as a slender aromatic shrub, flowering in June and July. The corollas are said to have been "white" on both collections cited below. The vernacular name, "tuyuguero", is reported for it.

Macbride (1960) cites Bonpland s.n., Raimondi s.n., Vargas 1462, and Weberbauer 6066 from Piura and Apurimac, Peru, noting that "Perhaps the Vargas specimen is L. Fiebrigii but the leaves are crenulate".

It should be noted that the corrected H.B.K. reference dates given here have been authenticated by Barnhart (1902).

Material of L. ferruginea has been misidentified and distributed in some herbaria as L. lopezii Moldenke.

Additional citations: PERU: Piura: F. R. Fosberg 27705 (Z); Sagástegui A., Cabanillas S., & Dios C. 8165 (N).

LIPPIA FILIFOLIA Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 12: 157—158. 1965; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 554 & 891. 1971.

Recent collectors describe this plant as a subshrub, the slender stems 0.7—1 m. tall, and the corollas yellow, and have found it

growing in sandy soil of cerrado as well as in cerrado in areas of pebbly cerrado and sandy grassy campo, at 850--1150 m. altitude, flowering in February, June, and July.

Material of this species has been misidentified and distributed in some herbaria as Aspilia buphthalmifolia DC.

Additional citations: BRAZIL: Minas Gerais: W. R. Anderson 8606 (N); Hatschbach, Anderson, Barneby, & Gates 36408 (N, Z); Martius 1378 (Mu--39--cotype), s.n. [in campo desertis ad M. Serra de S. Anto. Jul.; Macbride photos 20324] (Mu--38--cotype); Mexia 5889 (Ba).

LIPPIA FLAVIDA Urb.

Additional bibliography: Moldenke, *Phytologia* 12: 158--159. 1965; Moldenke, *Fifth Summ.* 1: 103 (1971) and 2: 891. 1971.

Ekman found this species growing in "soft limestone". Ekman H.16082, distributed as L. flavida, actually is Lantana microcarpa Urb.

Additional citations: HISPANIOLA: Haiti: Ekman H.1817 (Ld).

LIPPIA FLORIDA Cham.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Moldenke, *Phytologia* 13: 353. 1966; Moldenke, *Fifth Summ.* 1: 155 (1971) and 2: 891. 1971; Troncoso, *Darwiniana* 18: 339 & 410. 1974.

Recent collectors describe this plant as 1 m. tall, the bracts pale-violet to rose or purplish-rose, and have found it growing in rocky campos, "on open slopes with quartz gravel", and "in gravelly soil next to outcropping quartzite (itacolomite) slabs on knolls", at altitudes of 1030--1150 m., flowering in July and November. The Eitens describe the flowers as having the "corolla-tube white, throat golden-yellow", while Emygdio and his associates aver that the flowers were "yellow when young, rose in age".

The Williams & Assis 7160, distributed in some herbaria as L. florida, actually is L. pseudo-thea (A. St.-Hil.) Schau.

Additional & emended citations: BRAZIL: Minas Gerais: Eiten & Eiten 6840 (Ld, N, W--2688351), 6858 (Ac, W--2687468); Emygdio, Duarte, Becker, & Silva Santos 3351 (N); Hatschbach 29839 (W--2706161, Z); Héringer 5290 (Ld).

LIPPIA FORMOSA T. S. Brandeg.

Additional bibliography: Goldman, *Contrib. U. S. Nat. Herb.* 16: 262. 1916; E. W. Nels., *Mem. Nat. Acad. Sci.* 1 (16), imp. 1, 123 (1922) and 1 (16), imp. 2, 123. 1966; Moldenke, *Phytologia* 14: 406. 1967; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 891. 1971.

Recent collectors describe this plant as a shrub, 2 m. tall, the bracts papery, pink to nearly white, and found it flowering in January. Moran refers to it as "rare" or only "a few plants seen" and speaks of the corollas as "lavender, deeper or yellow at center", while Wiggins describes them as with the "corolla-tube yellow at anthesis, turning lavender in age, lobes lavender". Goldman

(1916) says that "A flowering specimen of this species was taken between San Pedro and Tres Pachitas [Baja California]....south of La Paz, December 24. It was noted in several places in the same vicinity, growing 1.8 to 2.5 meters high along with other shrubby vegetation in the midst of a forest of Pachycereus calvus, one of the giant cactuses of the region. Brandegee describes it as a common bush with rather showy flowers, growing on the hills about Todos Santos." Brandegee (1893) also notes that "It is related to the Brazilian species of Schauer's section Rhodolippia".

Additional citations: MEXICO: Baja California: Diquet s.n. (N, P, P); R. V. Moran 6979 (Sd—50615, Tu—175448); Norland s.n. [April 7, 1955] (Sd—45816); Wiggins 14536 (Se—208913, Tu—169784).

LIPPIA FRAGRANS Turcz.

Additional bibliography: Solered., Syst. Anat. Dicot. Ergänzt. 254 & 255. 1908; Reiche & Phil., Fl. Chil. 5: 298 & 299. 1910; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Moldenke, Phytologia 13: 353. 1966; Moldenke, Fifth Summ. 1: 192 & 402 (1971) and 2: 554 & 891. 1971.

Additional citations: CHILE: Atacama: Geisse 49 (Mu—1841).

LIPPIA FRANCENSIS Moldenke

Synonymy: Lippia dictamnus Mart. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional bibliography: Moldenke, Phytologia 13: 353. 1966; Angely, Fl. Anal. & Fitogeogr. S. Paulo, ed. 1, 4: 835. 1971; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971; Moldenke, Phytologia 34: 258 (1976) and 36: 44. 1977.

The Lippia dictamnus of Martius appears to be based on Martius s.n. from Cerro Frio, collected in July, 1851, deposited in the Munich herbarium.

The Angely (1971) reference, cited above, is sometimes cited as published in 1970, the title-page date, but, as has been previously stated, was not actually published until the following year.

Gibbs and his associates describe L. francensis as 1 m. tall, the corollas pale-lilac, and found it in flower in September. Material has been misidentified and distributed in some herbaria as L. gardneriana Schau., L. grandiflora Mart., and L. lupulina Cham.

Additional citations: BRAZIL: Goiás: Gibbs, Leitão Filho, Semir, Kinoshita, & Taroda 2777 (N); Lützelburg 388 (Mu), 1360 (Mu). Minas Gerais: Martius s.n. [Cerro Frio, Julio 1851] (Mu—55).

LIPPIA GARDNERIANA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 406. 1967; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971; Troncoso, Darwiniana 18: 339 & 410. 1974; Moldenke, Phytologia 36: 34. 1977.

Recent collectors describe this plant as a perennial herb or subshrub, 0.75--1.5 m. tall, the bracts purplish-pink to rose, and have encountered it in valleys and on wet slopes, at 800--1000 m. altitude, flowering in April and September. Anderson found it in "cerrado sloping down to gallery forest and 'brejo' (sedge meadow) at edge of forest". The corollas are said to have been "purple-pink" on Anderson 9503.

Material of L. gardneriana has been misidentified and distributed in some herbaria as L. corymbosa Cham. On the other hand, the Irwin & Soderstrom 7115 and Irwin, Souza, Grear, & Reis dos Santos 17812, distributed as L. gardneriana, actually represents L. primulina S. Moore.

Additional citations: BRAZIL: Goiás: W. R. Anderson 9503 (Ub); Haas & Belém 394 [Herb. Brad. 50506] (Ut--320431). Minas Gerais: Martius s.n. [in campis aridiusculis ad S. de S. Anto. Jul.] (Mu--33).

LIPPIA GEHRTII Moldenke

Synonymy: Lippia gerhtii Moldenke apud Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 835, sphalm. 1971. Lippia gerthii Moldenke apud Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: xi, sphalm. 1971.

Additional bibliography: Moldenke, Phytologia 14: 406. 1967; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 835 & xi. 1971; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971; A. L. Moldenke, Phytologia 23: 318. 1972; Moldenke, Phytologia 23: 433 (1972) and 28: 439. 1974.

As previously stated, the Angely (1971) reference, cited above, is often listed as published in 1970, the title-page date, but was not actually issued until 1971.

The Eitens and their associates describe L. gehrtii as an herb or shrub, 1--2 m. tall, and encountered it "in arboreal semi-closed cerrado of small trees and scattered shrubs -- scattered taller trees showing that the area was probably once a cerradão (a type of dense woodland), flowering in the dry season when few species are in flower." Others have found it in cerrado or in poor sandy soil of open shrubby cerrado, at altitudes of 750--780 m., flowering from May to July. The corollas were "rose, yellow inside of tube" on Hatschbach 34694, "rose" on Hatschbach 31880, and "lilac, inside of tube yellow" on Eiten & al. 2983.

Additional citations: BRAZIL: Mato Grosso: Hatschbach 31880 (Ld, N, W--2744572), 34694 (Ld). São Paulo: Eiten & Eiten 3282b (Ac); Eiten, Eiten, Felipe, & Freitas Campos 2983 (Ac, Ld, W--2745640).

LIPPIA GENTRYI Standl.

Additional bibliography: Moldenke, Phytologia 13: 354. 1966; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 891. 1971.

Wiggins reports that the "flowers [are] yellow at anthesis,

later nearly white".

Additional citations: MEXICO: Durango: S. J. Walker s.n. [25 August 1968] (Z). Sinaloa: I. L. Wiggins 13187 (Sd—49134).

LIPPIA GLANDULOSA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 406. 1967; Moldenke, Résumé Suppl. 16: 6. 1968; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 555, 559, & 891. 1971.

Recent collectors describe this plant as a shrub, 1—2 m. tall, and have encountered it on grazed campos and cerrado in upland valleys and "encosta rochosas de morro", at altitudes of 1200—1500 m., flowering in December and February. Irwin and his associates found it to be "common on rocky slopes". The corollas are said to have been "white" on Irwin & al. 20432 and "whitish" on Hatschbach & Pelanda 27897.

Material of L. glandulosa has been distributed in some herbaria as L. gracilis Schau. and as "Labiatae". On the other hand, the Retter, Bertoldo, Castro, Santos, & Souza R.913, distributed as L. glandulosa, actually is L. stachyoides Cham.

Additional citations: BRAZIL: Distrito Federal: Murça Pires, Silva, & Souza 9095 (W—2564109); Sucre 384 (Ld). Minas Gerais: Hatschbach 27897 (N); Hatschbach & Pelada 27897 (Ld); Irwin, Maxwell, & Wasshausen 19579 (Ac, N), 20432 (Ld, N). State undetermined: Collector undetermined 1572 (E—116720).

LIPPIA GLAZIOVIANA Loes.

Additional bibliography: Moldenke, Phytologia 12: 171—172. 1965; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 891. 1971; Moldenke, Phytologia 31: 384. 1975.

Recent collectors describe this plant as an erect, few-branched, spindly shrub or subshrub, 0.3—1 m. tall, growing from a xylodium, the bracts pinkish- or reddish-green. They have encountered it on campos, rocky campos, and rocky slopes, at altitudes of 1000—1500 meters, flowering from January to March as well as in May, September, and October, and fruiting in February and October. Harley and his associates found it in "grassland with low shrubs and scattered woodland", while Irwin and his associates encountered it on "grazed campo and cerrado in upland valleys" and "on outcrops in areas of cerrado on steep rocky slopes surrounded by campo". Hatschbach found it on "afloramentos rochosos".

The corollas are said to have been "rose" on Hatschbach 27041 & 29180, "rose-pink" on Irwin & al. 9399, "bright-pink" on Harley & al. 15541, "lilac-pink" on Irwin & al. 32832, "dull lavender-pink" on Irwin & al. 32798, "lilac, interior of tube whitish" on Hatschbach 36840, "red-purple, throat at first yellow, corolla finally concolorous" on Irwin & al. 12562, and "white" on Irwin & al. 19579.

Material of L. glazioviana has been misidentified and distributed in some herbaria as L. gracilis Schau.

Additional citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15541 (Ld). Goiás: Hatschbach 36840 (Ld); Irwin, Grear, Souza, & Reis dos Santos 12562 (N, Z); Irwin, Harley, & Smith 32798 (Ld, N, W—2709805), 32832 (Ac, N, W—2709804); Irwin, Souza, & Reis dos Santos 9399 (N). Minas Gerais: Hatschbach 27041 (Ld), 29180 (Ld, W—2744561).

LIPPIA GOSSWEILERI S. Moore

Additional bibliography: Moldenke, *Phytologia* 12: 172. 1965; Moldenke, *Fifth Summ.* 1: 244 (1971) and 2: 891. 1971.

The original type (holotype) specimen of this species is deposited in the herbarium of the British Museum (Natural History) in London.

Additional citations: ANGOLA: Province undetermined: Gossweiler 3349 [Munonque; Mo. Bot. Gard. photo A.832] (Gz—photo of type, N—photo of type).

LIPPIA GRACILIS Schau.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; T. Peckolt, *Bericht. Deutsch. Pharm. Gesell.* 14: 469—470. 1904; Moldenke, *Phytologia* 13: 354. 1966; Moldenke, *Fifth Summ.* 1: 155 & 366 (1971) and 2: 563, 565, 891, & 968. 1971; Moldenke, *Phytologia* 34: 258 (1976) and 36: 34. 1977.

Recent collectors describe this plant as a slender, dense, or spindly, brittle shrub or perennial herb, 0.4—4 m. tall, the leaves rugose, dark-green above, paler or gray-green beneath, with "a sickly sage scent", and the bracts pale-green. They have found it growing at altitudes of 220—1200 m., flowering from January to July. Harley and his associates encountered it in "caatinga or caatinga/cerrado frequently burned- and cut-over", in "largely secondary woodland", "on dry quartzite hillside with disturbed woodland on lower slopes and scrub above", on "dry hillsides with quartzite metamorphic rocks and damp sandy riverbed with surrounding caatinga", and "in waste ground with scattered shrubs and marshy lake-margins". The Eitens found it "on flat narrow mountain top" and "flat ridge top with open tree canopy and lots of tall jurema (*Mimosa*) shrubs, the soil with no or few stones", reporting the local common name of "alacrim"; Irwin and his associates found it in cerrado, while Davidse and his associates report it "common in cerrado on flat plains, on cliffs by waterfalls", and in cerrado on sandy soil with Aristida and Axonopus being the dominant grasses.

The corollas are described as having been "white" on Davidse & al. 11763, 11963, & 12070, Eiten & Eiten 10807, Harley & al. 15158 & 16269, and Irwin & al. 14925, "pure-white" on Harley & al. 16444, "white with orange throat" on Harley & al. 16390, "white with golden-yellow throat" on Eiten & Eiten 4492, and "creamy-white with yellow throat" on Harley & al. 16778. [to be continued]

STUDIES IN THE HELIANTHEAE (ASTERACEAE). XII.

RE-ESTABLISHMENT OF THE GENUS SMALLANTHUS.

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In the Heliantheae subtribe Melampodiinae the genera are often well-marked and there seems to be little need to the casual observer for subtle generic distinctions. It is in this climate that the concept of Polymnia has been maintained for coarse herbs or shrubs in the subtribe having opposite leaves and ray achenes not enclosed in a bract. In the recent monograph by Wells (1965) no consideration seems to have been given to any alternative concept. The existence of the segregate genus Smallanthus of Mackenzie (1933) was scarcely noted by Wells under the synonymy of Polymnia uvedalia (L.) L. A re-evaluation shows that Smallanthus is a valid genus that should be expanded from the one species originally included to contain the majority of the species which have previously been placed in Polymnia.

The initial difference between the two genera noted in the present study and in the characterization of Mackenzie is the form of the achene. In Polymnia the achene walls are smooth without striations while Smallanthus has shallow grooves that are evident on the surface. Not mentioned by Mackenzie were the shape of the achenes, tangentially broadened and flattened with three to five distinct ribs in Polymnia, and radially thickened and laterally compressed often without distinct ribs in Smallanthus. The wall of the Smallanthus achene is also very thick with a massive layer of softer internal tissue not seen in the thin walls of Polymnia. The outer cell layer of Polymnia differs in the regular pattern of small broadly hexagonal cells more or less in rows.

Mackenzie (1933) noted as a second character the basic pinnate venation of the Polymnia leaf. The lower part of the leaf blade has at least a pair of short lobules and often has many pinnately disposed lobes. Most species of Smallanthus do have trinervate or palmately lobed leaf blades, but there are some species such as S. macvaughii and S. oaxacanus with pinnately lobed leaf blades.

A number of differences occur in addition to

those mentioned by Mackenzie. Polymnia does not have the distinct whorl or near whorl of outer involucre bracts which is one of the most prominent features of Smallanthus. Polymnia has glands on the thin anther appendages while such glands are apparently lacking on the indurated anther appendages of Smallanthus. The hairs on the corollas of Polymnia including the numerous hairs of the tube of the rays are thin-walled and blunt-tipped. The corolla hairs of Smallanthus seem particularly firm and sharp-pointed in contrast. The lobes of the disk corollas of Polymnia have a feature lacking in not only Smallanthus but other genera of the Heliantheae, a series of short multicellular hairs along the margin many of which are on the inside surface. The various cytological studies of the species are reviewed by Wells (1965). The two species of Polymnia have a number of $n=15$. Species of Smallanthus with the exception of some dubious or polyploid counts seem to have $n=16$ with one count of $n=17$.

Clear evidence of phyletic distance between Smallanthus and Polymnia is available, but exact relationships remain in doubt for three reasons. The first is that numerous differences also occur between both genera and all others with which they might be compared, the second is the apparent artificiality of the subtribe Melampodiinae as was partially noted in the study by Stuessy (1973), and the third is the problem of interpreting the character of striations on the achene. The achene striation has been of great value in delimiting other subtribes of the Heliantheae, but it does not correlate well with other characters in the Melampodiinae. It is not even certain that the poorly differentiated undulating structure in Smallanthus is equivalent to striations as seen in other genera of the tribe. The latter are usually not evident on the surface of the achene but have clear cell differentiation internally. Melampodium has regular striations in the achene wall and might be closely related to Smallanthus, but Acanthospermum which has been placed close to Melampodium has no regular striations. Espeletia usually lacks striations which would be more like Polymnia, but the achene shape is nearer Smallanthus. In all the comparisons the impression persists that true Polymnia is the most isolated among the genera of the subtribe. It is clear that the characters on which relationships in the Melampodiinae have been based need complete re-evaluation, and this can be done properly only by considering Polymnia and Smallanthus as separate entities.

The genus Polymnia is typified by P. canadensis L. which was interpreted broadly by Wells (1965) to include P. variabilis Poiret, the type species of Polymniastrium Lam. The latter was based on material in which the ray corollas lacked a limb. The only other species in the genus is P. laevigata Beadle. Both species are restricted to eastern North America. The remaining species treated by Wells fall into the genus Smallanthus with the addition of one new species, one species more recently described by Wells (1967), and one species resurrected from synonymy.

Smallanthus Mackenzie in Small, Man. Southeast. Fl. 1406. 1933. Type species: Osteospermum uvedalium L.

Smallanthus apus (Blake) H. Robinson, comb. nov.
Polymnia apus Blake, Contr. U.S. Nat. Herb. 22: 604. 1924. Mexico.

Smallanthus connatus (Spreng.) H. Robinson, comb. nov.
Gymnolomia connatum Spreng., Syst. Veg. 3: 610. 1826. Uruguay, Brasil, Paraguay, Argentina.

Smallanthus fruticosus (Benth.) H. Robinson, comb. nov.
Polymnia fruticosa Benth., Pl. Hartw. 209. 1845. Ecuador, Colombia, Peru.

Smallanthus glabratus (DC.) H. Robinson, comb. nov.
Polymnia glabrata DC., Prodr. 5: 515. 1836. Chile, Ecuador, Peru.

Smallanthus jelskii (Hieron.) H. Robinson, comb. nov.
Polymnia jelskii Hieron., Bot. Jahrb. 36: 484. 1905. Peru. The double corollas of the rays cited by Wells (1965) are an unreliable character, but the species can be distinguished from the closely related S. pyramidalis by the very short limbs of the ray corollas and by the finer denser hairs on the pedicels and paleae.

Smallanthus latisquamus (Blake) H. Robinson, comb. nov.
Polymnia latisquama Blake, Journ. Wash. Acad. Sci. 16: 421. 1926. Costa Rica. The species was placed in the synonymy of S. quichensis by Wells (1965) but it has much larger heads on stout pedicels and the upper leaf surface is not or scarcely scabrous.

Smallanthus lundellii H. Robinson, sp. nov.
Plantae herbaceae vel suffrutescentes 1 m altae?
Folia opposita, petiolis 0.5-1.5 cm longis non alatis;

laminae ovato-ellipticae usque ad 20 cm longae et 13 cm latae base anguste cuneatae margine utrinque plerumque 2-3-angulato-dentatae et multo remote mucronato-denticulatae apice anguste breviter acuminatae in quadrante inferiore valde trinervatae supra nigro-virides sparse scabridae subtus pallido-virides in nervis et nervulis pilosae. Inflorescentiae paucicapitatae saepe subscaposae, pedicellis 3.0-3.5 cm longis dense hirtellis et stipitato-glanduliferis. Capitula late campanulata; squamae involucris exteriores 5 base breviter connatae subrotundatae 6-12 mm longae et latae margine multo crenatae et sparse pilosulae apice obtusae intus puberulis extus minute puberulae et in medio breviter pilosae; bracteae interiores ca. 10 late obovatae ca. 5 mm longae et 4 mm latae margine integrae apice obtusae extus dense puberulae et breviter stipitato-glanduliferae; flores radii ca. 10; corollae flavae, tubis ca. 2 mm longis dense hirtellis, limbis oblongis ca. 13 mm longis et 7.5 mm latis apice breviter tridentatis; flores disci ca. 100; corollae flavae 6.0-6.5 mm longae, tubis ca. 1 mm longis glabris, lobis ca. 1 mm longis et latis extus paucae valde scabridis; filamenta in parte superiore ca. 0.4 mm longa; thecae antherarum nigrescentes ca. 1.8 mm longae; appendices antherarum ovatae 0.5-0.6 mm longae ca. 0.4 mm latae; achaenia radii subglobosa vel obovata 4.0-4.5 mm longa nigra; pappus nullus. Grana pollinis ca. 32 μ in diam.

TYPE: GUATEMALA: Baja Verapaz: Union Barrios, on the Salama-Coban Road, south of km. 147, in high forest on hill. Coarse herb, rays of flowers yellow. Feb. 5, 1975. C.L. Lundell & E. Contreras 18916 (Holotype US, isotypes in Lundell Herbarium at Dallas).

Smallanthus lundellii has the petiole unwinged below the cuneate base of the leaf blade and it would key to S. quichensis in treatments that emphasize that character. The new species differs from both S. quichensis and the related S. latisquamus by the more angulate lower leaves and the densely pubescent pedicels. The species is named for the collector, Dr. Cyrus L. Lundell, who has donated the holotype for deposit in the U.S. National Herbarium.

Smallanthus maculatus (Cav.) H. Robinson, comb. nov.

Polymnia maculata Cav., Icon. Pl. 3: 14. 1794.
Mexico, Central America. 1795.

Smallanthus macvaughii (Wells) H. Robinson, comb. nov.

Polymnia macvaughii Wells, Brittonia 19: 392. 1967.
Mexico.

- Smallanthus meridensis (Steerm.) H. Robinson, comb. nov. Polymnia meridensis Steerm., Fieldiana, Bot. 28: 667. 1953. Venezuela, Colombia.
- Smallanthus microcephalus (Hieron.) H. Robinson, comb. nov. Polymnia microcephala Hieron., Bot. Jahrb. 29: 33. 1900. Ecuador.
- Smallanthus oaxacanus (Sch. Bip. ex Klatt) H. Robinson, comb. nov. Polymnia oaxacana Sch. Bip. ex Klatt, Leopoldina 23: 89. 1887. Mexico, Central America.
- Smallanthus parviceps (Blake) H. Robinson, comb. nov. Polymnia parviceps Blake, Contr. U.S. Nat. Herb. 22: 604. 1924. Peru, Bolivia.
- Smallanthus pyramidalis (Triana) H. Robinson, comb. nov. Polymnia pyramidalis Triana, Ann. Sci. Nat. ser IV, 9: 40. 1858. Colombia, Venezuela, Ecuador.
- Smallanthus quichensis (Coult.) H. Robinson, comb. nov. Polymnia quichensis Coult., Bot. Gaz. 20: 48. 1895. Guatemala.
- Smallanthus riparius (H. B. K.) H. Robinson, comb. nov. Polymnia riparia H. B. K., Nov. Gen. et Sp. ed folio 4: 222. 1818. Colombia, Venezuela, Peru, Ecuador, Bolivia, Guatemala.
- Smallanthus siegesbeckius (DC.) H. Robinson, comb. nov. Polymnia siegesbeckia DC., Prodr. 5: 516. 1836. Brazil, Paraguay, Bolivia, Peru.
- Smallanthus sonchifolius (Poepp. & Endl.) H. Robinson, comb. nov. Polymnia sonchifolia Poepp. & Endl., Nov. Gen. et Sp. Pl. 3: 47. 1845. Peru, Ecuador, Bolivia.
- Smallanthus suffruticosus (Baker) H. Robinson, comb. nov. Melampodium suffruticosum Baker in Mart., Fl. Bras. 6 (3): 162. 1884. Venezuela.
- Smallanthus uvedalius (L.) Mackensie in Small, Man. Southeast. Fl. 1406. 1933. Osteospermum uvedalia L., Sp. Pl. 2: 923. 1753.

Mackenzie, K. K. 1933. Carduaceae 56. Smallanthus.
in J. K. Small, Manual of the Southeastern Flora.
1307, 1406.

Stuessy, T. F. 1973. A systematic review of the
Subtribe Melampodiinae (Compositae, Heliantheae).
Contr. Gray Herb. Harvard Univ. 203: 65-80.

Wells, J. R. 1965. A taxonomic study of Polymnia
(Compositae). Brittonia 17: 144-159.

———. 1967. A new species of Polymnia (Compositae:
Heliantheae) from Mexico. Brittonia 19: 391-394.



Smallanthus lundellii H. Robinson, Holotype,
United States National Herbarium. Photos by Victor E.
Krantz, Staff Photographer, National Museum of Natural
History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXI.

A NEW GENUS, CORETHAMNIUM.

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Generic revisions of the tribe Eupatorieae have often been complicated by the discovery of totally undescribed entities that could not be anticipated in the systematic review of known species. Such entities are particularly troublesome if they superficially resemble known species or groups and if they remain unnoticed under erroneous identifications. An example is a species collected many years ago during the Cichona expeditions to the northern Andes. The species bears a superficial resemblance to members of the genus Ageratina subgenus Andinia which are common in the area and it is only an attempt to identify some of the latter species that brought the new genus to light. It is particularly notable that the new genus is not even in the subtribe Oxylobinae which contains Ageratina and it will undoubtedly eventually be found not to have the distinctive chromosome base numbers known for that subtribe.

The new genus is sufficiently specialized to present some problems of placement but the most significant feature seems to be the strongly subimbricate involucre. Essentially smooth corolla lobes and a glabrous unenlarged style base further indicate a Critonioid placement. The only character in conflict would be the distinctly papillose style appendages and that alone would not preclude such a relationship. One feature that precluded relation to the Oxylobinae is the poorly delimited carpopodium with small thick-walled cells.

The genus has two particularly distinctive features in the corolla form and the pubescence of the leaves. The long lobes of the corolla seem to arise directly from the tube and the throat can only be distinguished by observing the insertion of the filaments. The tube is also remarkably thick and firm. The hairs of the vegetative parts of the plant are unique in their vermiform nature with various parts 1-3-seriatae. While other hairs of the Eupatorieae have equally short cells they do not have such thick walls. The hairs have thin-walled cells at the base which seems to correlate with the ease of dehiscence. Older leaves become nearly glabrous.

The collection locality in the Choco of Colombia is at higher elevations adjacent to the Dept. of Antioquia and seems likely to contain many distinctive

species and genera of plants.

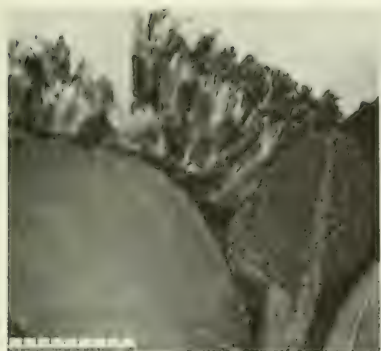
Corethamnium chocoensis R. M. King & H. Robinson, gen. et sp. nov. (Eupatorieae) Asteracearum. Plantae frutescentes usque ad 1.5 m altae erectae multo ramosae. Caules atrofulvescentes teretes dense pilosi, pilis brevibus crassis; internodiis plerumque 1.5-2.5 cm longis. Folia opposita, petiolis 3-5 mm longis dense pilosa; laminae coriaceae suborbiculares plerumque 1.5-3.5 cm longae et 1.0-2.8 cm latae penninervatae base late acutae margine crenato-serrulatae apice breviter obtuse vel rotundatae subtus pallidiores juventute dense pilosae, pilis facile deciduis in nervis subsistentibus brevibus crassis irregulariter 2-3-seriatis, parietibus plerumque incrassatis in cellulis basilari-bus tenuioribus. Inflorescentiae parvae corymbosae terminales in ramis foliatis, pedicellis 1-3 mm longis dense pilosis. Capitula ca. 8 mm longa et 3 mm lata breviter cylindrica. Squamae involucris 16-18 subimbri-cate valde inaequales 1.5-6.0 mm longae et 1.5-2.0 mm latae late ovatae vel oblongae margine anguste scario-sae minute fimbriatae apice rotundatae extus glabrae vel glabrescentes; receptacula glabra. Flores ca. 6 in capitulo; corollae albae ca. 5 mm longae infundibulares, tubis ca. 2 mm longis valde induratis, faucis 1.0-1.3 mm longis base indistinctis, tubis et faucis in tubis angustis combinatis extus persparse glanduliferis, lobis anguste oblongis 1.5-1.8 mm longis et ca. 0.6 mm latis margine incrassatis utrinque laevibus extus superne dense glanduliferis, cellulis breviter oblongis, pari-etibus non sinuosis; filamenta in parte inferiore ca. 1.5 mm longa laevia; filamenta in parte superiore 0.30-0.35 mm longa, cellulis plerumque quadratis, parietibus vix ornatis; thecae ca. 1.2 mm longae; appendices antherarum ovatae ca. 0.35 mm longae et 0.2 mm latae; scapi stylorum aliquantum incrassati glabri; rami stylorum lineares, appendicibus plerumque marginaliter et abaxialiter longe papillois; achaenia prismatica 5-costata plerumque glabrae apice glandulifera, raro pilifera; carpopodia breviter cylindrica superne leniter demarcata, cellulis 3-5-seriatis breviter oblongis 20-25 μ longis et 18-20 μ latis, parietibus incrassatis; setae pappi ca. 45 congestae 1-2-seriatae plerumque 3.0-4.5 mm longae margine dense et irregulariter scab-rellae sensim superne subintegrae apice subacutae. Grana pollinis ca. 25 μ in diametro argute spinosa.

TYPE: COLOMBIA: Choco: In a scrub thicket ("paramillo") alto de La Clara, elev. 2680 m.; NW of El Carmen. Shrub to 4 ft.; flowers white. February 29, 1944

Earl L. Core 319 (Holotype US).

Acknowledgement

This study was supported in part by the National Science Foundation Grant DEB77-13457 to the senior author.



Corethamnium chocoensis R.M.King & H.Robinson,
Holotype, United States National Herbarium. Photos by
Victor E. Krantz, Staff Photographer, National Museum
of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXII.
A NEW GENUS, CASTENEDIA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560

The isolated Sierra de Santa Marta in northern Colombia is notable for a flora with many endemics related to forms in the nearby Andes. It is not surprising that the area contains an endemic genus of the Eupatorieae related to the Critonioid genera of the Andes. The genus, previously undescribed, is here named Castenedia for R. Romero Castañeda, one of the two collectors on a joint expedition in January of 1959.

The new genus is obviously related to the group of Andean genera that includes Grosvenoria and Badilloa. The related group of genera is marked by modified stylar appendages that are broad throughout their length. Castenedia shares the tendency for modification of the appendage but shows a narrow rather than broad form. The style branch narrows above the stigmatic lines into a filiform essentially terete tip. This is particularly obvious because of the breadth of the stigmatic portion. Terete style appendages occur also in the Eupatorieae in such genera as Hebeclinium DC. and Critoniella K & R but the styles of the latter are of much finer structure and do not seem to represent a close relationship. Hebeclinium is most obviously distinct by the strongly convex receptacle and Critoniella includes less shrubby plants with trinervate leaves.

Both specimens of Castenedia show a peculiarity of internodes. Sporadically a pair of nodes are borne very close together which results sometimes in a congested branching. The feature is rather obvious in spite of considerable variation in length of other internodes.

Castenedia santamartensis R. M. King & H. Robinson, gen. et sp. nov. (Eupatorieae) Asteracearum. Plantae frutescentes usque ad 4 m altae multo ramosae. Caules fulvescentes subteretes vel subangulati glabri, nodis in marginem induratum persistentem expansis, internodiis plerumque 2-5 cm longis interdum perbrevis 3-10 mm longis. Folia opposita, petiolis 7-13 mm longis; laminae ellipticae vel oblongo-ellipticae vel leniter obovatae plerumque 5.0-8.5 cm longae 2-4 cm latae penninervatae base breviter abrupte acutae margine remote crenato-serrulatae apice breviter acutae

vel obtusae interdum subacuminatae supra glabrae sub-
tus pallidiores obscure glandulo-punctatae in nervis
et nervulis vix prominulis. Inflorescentiae dense
corymbosae, ramis et ramulis sparse puberulis. Capit-
ula sessilia vel subsessilia cylindrica in glomerulis
paucicapitatis ca. 12 mm longa et 2 mm lata; squamae
involucri ca. 25 subimbricatae valde inaequales 1-7 mm
longae 0.5-1.5 mm latae ovatae vel oblongo-lineares
interiores facile deciduae margine anguste scariosae
apice obtusae vel rotundatae extus castaneae subglabrae
superne obscure glandulo-punctatae; receptacula plana
glabra. Flores 6-7 in capitulo; corollae albae 5.0-5.5
mm longae anguste infundibulares, tubis ca. 2 mm longis
angustis sparse glanduliferis, faucis ca. 3 mm longis
subfusiformibus sparse glanduliferis, lobis triangular-
ibus ca. 0.8 mm longis et ca. 0.5 mm latis utrinque
laevibus extus dense glanduliferis, cellulis oblongis,
parietibus vix sinuatis; filamenta in parte inferiore
ca. 1.5 mm longa laevia; filamenta in parte superiore
ca. 0.5 mm longa, cellulis plerumque quadratis, parie-
tibus vix ornatis; thecae ca. 1.5 mm longae; appendices
antherarum ovatae ca. 0.45 mm longae et 0.2 mm latae;
scapi stylorum aliquantum incrassati glabri; appendices
stylorum filiformes sensim teretes ubique breviter
papillosae; achaenia ca. 3 mm longa prismatica 5-costata
glabra; carpopodia breviter obturaculiformia superne
subabrupte demarcata, cellulis plerumque oblongis ca.
30-50 μ longis et 17-20 μ latis, parietibus incrassatis;
setae pappi ca. 60 congestae 1-2-seriatae 2.0-5.5 mm
longae superne tenuiores base extus et margine scabrid-
iores, cellulis apicalibus argute acutis. Grana poll-
inis 25-27 μ in diametro argute spinosa.

TYPE: COLOMBIA: Magdalena: del Paramo a Gebolleta.

Alt. 2400-3100 m. Enero 31 1959. R. Romero

Castañeda 7173 (Holotype COL). Paratype

COLOMBIA: Magdalena: Sierra Nevada de Santa Marta;
entra San Pedro y cabeceras del Rio Sevilla.

Jan. 31, 1959. Alt. ca. 3250 m. Harriet G. Bar-
clay & Pedro Juajibioy 6780 (US).

Acknowledgement

This study was supported in part by the National
Science Foundation Grant DEB77-13457 to the senior
author.



Castenedia santamartensis R.M.King & H.Robinson,
Holotype, Herbario Nacional Colombiano, Bogota. Photos
by Victor E. Krantz, Staff Photographer, U.S. National
Museum of Natural History

BOOK REVIEWS

Alma L. Moldenke

"PROGRESS IN BOTANY — Morphology, Physiology, Genetics, Taxonomy, Geobotany Volume 36" or "FORTSCHRITTE DER BOTANIK — Morphologie, Physiologie, Genetik, Systematik, Geobotanik Volume 36" edited by H. Ellenbeck, K. Esser, H. Merxmüller, E. Schnepf & H. Ziegler, xviii & 359 pp., 16 fig. & 2 tab. as b/w illus., Springer-Verlag, New York, Heidelberg & D-1000 Berlin 33. 1974. DM.98 or \$40.20.

The preface appears first in German and then in English announcing this volume as the first predominantly in "English which is increasingly assuming the role played by Latin in the Middle Ages: it is the new lingua franca of science". This valuable publication can thus serve a larger group of readers.

Under each of the following topics, in order, there are given especially interesting condensed notes with sources: algal cytology, flavonoid biosynthesis, extrakaryotic inheritance, phylogeny of the fungi and lichens, and the vegetational history during the Quaternary.

"PROGRESS IN BOTANY — Morphology, Physiology, Genetics, Taxonomy, Geobotany Volume 37" or "FORTSCHRITTE DER BOTANIK Volume 37" edited by H. Ellenberg, K. Esser, H. Merxmüller, E. Schnepf, & H. Ziegler, xvii & 402 pp., 18 figs. & 1 tab. as b/w illus., Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1975. \$49.20.

The objective continues "to furnish concise and prompt reports (in 2 to 3 year rotation, at most) on all subject areas of botany.. describing worthwhile factual or methodological advances" as reported by competent specialists throughout the world.

Under each of the above-mentioned topics, in turn, especially interesting condensed notes, with sources, cover the morphogenesis of specialized cells in higher plants, light control of locomotion and chemotaxis, physical and chemical mutagens, sex distribution in higher plants, and several ecological notes appended to the section on geobotany.

"PROGRESS IN BOTANY — Morphology, Physiology, Genetics, Taxonomy, Geobotany Volume 38" or "Fortschritte der Botanik Volume 38" edited by H. Ellenberg, K. Esser, H. Merxmüller, E. Schnepf & H. Ziegler, xvii & 377 pp., 23 fig., 2 maps & 1 tab. as b/w illus., Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1976. \$49.20.

"The basic character of the series remains unchanged" and its value considerable on a worldwide basis. For each of the above topics pertinent condensed notes, with sources, are given as: the structure and biochemistry of the Golgi apparatus, plant lectins or phytohemagglutinins of membranes effective in the aggregation of cellular slime molds and adhesion of symbiotic rhizobia to legume roots, the "one chromomere one gene" concept, problems involved in the five-kingdom series, and perennial arid grasslands as among the most important American semidesert vegetation types subject to anthropogenous influences.

"WEST OF THE ROCKY MOUNTAINS" edited by John Muir, ii & 508 pp., 573 fig. & 138 fullpage plates as b/w illus., Running Press, Philadelphia, Pa. 19103. 1976. Third printing. \$8.95 paperbound, oversized & 25 ¢ postage

This treasurable book was originally published in 1888 and was then entitled "Picturesque California and the Region West of the Rocky Mountains, from Alaska to Mexico". There are six wonderful chapters by John Muir himself on the peaks, the glaciers, the passes and Yosemite Valley in the high Sierras as well as those on Mount Shasta, Washington and Puget Sound and the Columbia River basin. A dozen other writers have provided interesting chapters on early mining, the redwoods, the Lick Observatory, southern California, etc.

The book is copiously and most effectively illustrated. It is fortunate that readers can now acquire it so readily and so inexpensively.

"THE GENETIC BASIS OF EVOLUTIONARY CHANGE" by R. C. Lewontin, xiii & 346 pp., 29 figs. & 62 tab. as b/w illus., Columbia University Press, London & New York, N. Y. 10025. 1974. \$12.50 clothbound hardcover & \$4.50 paperbound.

This stimulating book is No. 25 in the Columbia Biological Series and is based on the Jesup Lectures given there in 1969 and honed by the theoretical and practical learning of the subsequent years to answer the question of "How much genetic variation is there that can be the basis of adaptive evolution?" The genome as a functional array of gene products (as enzymes) should be considered the unit of selection.

Consistent with the author's style almost all interpretations of experiments and conclusions are attacked logically for flaws due to omissions and commissions. This book makes important reading for all students of genetics, evolution and related fields.

"BEGINNING HYDROPONICS — Soilless Gardening: A Beginner's Guide to Growing Vegetables, House Plants, Flowers, and Herbs Without Soil" by Richard E. Nicholls, v & 126 pp., 13 figs. & 6 tab. as b/w illus., Running Press, Philadelphia, Pa. 19103. 1977. \$3.95 paperbound & 25 ¢ postage.

The subtitle about "tells it all" except for a chapter on the prevention and treatment of problems and a list of resources. The author suggests hydroponics will become a common form for home gardening, for the space program and for impoverished peoples.

My own first impression of highly successful hydroponics dates from the early 1930s to the gorgeous tomatoes raised in the Columbia University botany department greenhouse for Pres. Butler.

"THE PLANT DOCTOR — Growing and Healing Indoor Plants" by Richard E. Nicholls, 108 pp., 42 b/w fig., Running Press, Philadelphia, Pa. 19103. [1975], Fifth printing 1976. \$3.95 paperbound & 25 ¢ postage.

This "guide to green health" works from "a simplified list of the most commonly occurring major plant symptoms. Under each..... are considered all [!] of the possible causes" with text references to treatment.

Plant resources are listed at the end.

"THE PLANT BUYER'S HANDBOOK — A Consumer's Guide to Buying House Plants" by Richard E. Nicholls, 142 pp., 25 fig. & 3 tab. as b/w illus., Running Press, Philadelphia, Pa. 19103. 1976. \$3.95 paperbound & 25 ¢ postage.

This well organized book has four parts: (1) before you go shopping to analyze and adjust your home environment, (2) when you go shopping with what and how to buy, (3) house plant primer of what to do with the purchases at home, and (4) resources of organizations, suppliers, annotated bibliography, U.S.D.A. importation requirements and a helpful table of almost 200 house plants with their individual light, temperature and humidity needs and ease of growing.

"ENERGY BOOK No. 1 Natural Sources & Background Applications" edited by John Prenis, 112 pp, 120 fig. & 8 tab. as b/w illus., Running Press, Philadelphia, Pa. 19103. 1975, 4th printing. \$4.00 paperbound oversized & 25 ¢ postage.

"This book is an overview of possible alternative sources of energy". A brief introduction concerning the nature and forms of energy is followed by R. Buchminster Fuller's "Energy through Wind Power [which] permits humanity to participate in cosmic economics and evolutionary accommodation without in any way depleting

or offending the great ecological regeneration of life on Earth."

There are stimulating discussions of and helpful diagrams of some wind-driven generators, methane generators, and geothermal, ocean thermal, and tidal, solar and solar satellite energy units for various purposes. There is a selected annotated bibliography and a request for additional amateur experiments "with a bigger and better Energy Book No. 2" in mind.

"HERB GROWER'S GUIDE — Cooking, Spicing & Lore" by John Prenis, 92 pp., 25 figs. & 2 tab. as b/w illus., Running Press, Philadelphia, Pa. 19103. 1974. \$2.50 paperbound & 25 ¢ postage.

This pleasant little book relates bits of the growth, uses and folklore about 25 common herbs. Each has a line drawing sketch, some (parsley, rosemary, & lemon verbena) of which are careless enough to be space-wasters. Lemon verbena is now more correctly known as Aloysia triphylla, rather than as Lippia citriodora.

"AN ILLUSTRATED HISTORY OF THE HERBALS" by Frank J. Anderson, xv & 270 pp., 110 b/w figs. as illus., Columbia University Press, New York, N. Y. 10025. 1977. \$16.95.

This book displays a delightful combination of erudition and charm in its descriptive accounts of 30 herbals arranged historically from Dioscorides' "De Materia Medica" to Hernandez' "Rerum Medicarum". It also adds biographical notes about the known, supposed or usurping authors, including varying renderings of their names and bibliographic notes about availability of copies, differing titles, separate editions, translations, publishers and illustrations. This book reproduces 110 woodcuts chosen from each of these herbals. One is a generalized figure labeled Verbena to which Apuleius assigned 24 names and 12 remedial uses in his herbal (original manuscript ca. 400 A.D.). It and depictions of 129 other plants appeared in the first fully illustrated herbal ever printed (ca. 1481).

"BOTANY — A TEXTBOOK FOR COLLEGES 4th Edition" by J. Ben Hill, Henry W. Popp & Alvin R. Grove Jr., iii & 634 pp., 4 color plates, 455 figs. & 2 tab. as b/w illus., Robert E. Krieger Publishing Company, Huntington, N. Y. 11743. 1977 Reprint. \$18.50.

This excellent old-time text grew out of the careful teaching experiences of the authors at Pennsylvania State University with editions published by McGraw Hill in 1936, 1950, 1960 and 1967 appearing in facsimile here and making an excellent supplementary text for today's courses. For folks whose original botany training and teaching date back to this approach, the book is nostalgically gratifying.

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NOTES ON THE CLUSIACEAE - CHIEFLY OF PANAMA. III.

Bassett Maguire¹

The present, Part III, concludes the series of notes in report on a preliminary review of Panama Clusiaceae which had been sent to me by the preparators of Flora of Panama. Part III presents reports on nine species of Clusia, six of them proposed as new. My own Clusia salvinii var cupulata is elevated to specific status. Tovomita morii is also here submitted following a review of its close Amazonian and Guianan relatives, the members of the T. macrophylla-complex. As a result of the indicated brief review a further name, Tovomita froesii, to be assigned to the complex is required.

1. Clusia divaricata Maguire, sp nov

Sectione Euclusia Engl. dubie assignata.

Arbor parva ad 15 m alta vel scandens; latice albido moderato; ramulis teretibus; foliis valde petiolatis, petiolo vulgo 3-5 cm longo, fovea petioli non-conspicua; laminis oblongo-ellipticis vulgo 15-25 cm longis, 8-12 cm latis, abrupte acuminate, venis lateralibus inconspicuis, adscendentibus 10°-15° angulo; inflorescentiis terminalibus, plurifloribus; masculinis: racemi-cymosis, vulgo 15-25 cm longis, bracteis naviculi-acutis, ramis divaricatis, cymosis, vulgo 3-floribus, conspicue bracteatis, floribus saepe nectantibus; sepalis 4, decussatis, late rotundatis, 6-8 mm longis, vittatis, marginatis; petalis 6-8, late oblanceolatis, ca 3 cm longis, valde vittatis, marginibus aliquantum irregulariter crenatis, roseo-albidis; receptaculo plano, staminibus fertilibus, 3-4-serialibus, in brevi corona portatis; filamentis ca 1.5 mm longis; antheris linearibus, 2.0-2.5 mm longis, mucrone ca 0.5 mm longo instructis, 4-theclatis, lateraliter dehiscentibus; granis pollinis sphaeroideis, triplicoratis, ca 20-25 u diam, exinio subtiliter rugulato-reticulato; intus staminodiis numerosis, liberis, linearibus, sessilibus, ca 3 mm longis, sterilibus; inflorescentiis foemineis vulgo 6-12 cm longis, bracteis conspicuis, ramis divaricatis, vulgo unifloribus; sepalis 4, depresso-rotundatis, concavis, ad 12 mm latis, scarior-marginatis; petalis 6-8; staminodiis compressis, 2-3 mm longis, 2-serialibus, in brevi corona instructis; ovario 10-12-locularibus; fructibus apparenter obovatis, stylis brevi-conicis, stigmatibus sessilibus; ovulis multis, seminibus

¹ The New York Botanical Garden

ignotis.

Type. Small or subscandent tree with whitish latex, petals white, occasional, margins of high bush, La Mesa, 6 km above El Valle, ca 600 m alt, Prov. Coclé, Panama, 18 Jan 1975, Bassett Maguire & Yung-chau Huang 65521 (holotype NY).

Distribution. Small trees to 15 m high, usually at margins of woodland, frequent at 600-1200 m alt, Coclé, Panamá, and Veraguas provinces, Panama.

PANAMA. Prov. Coclé: terrestrial laticiferous tree, fruits green, in this *Clusia* there are at least 4 leaf types of *Clusia* and 2 fruit types, in cloud forest on slopes of Cerro Pilon near El Valle, 700-900 m alt, 10 Jun 1967, Duke 12086 (NY); small tree 8 m high, ♂, latex moderate, white, sepals 2 pairs, white, pedicel white, petals white, ca 2.5 cm long, La Mesa, Cerro Gaital, 3 mi NW of El Valle, 9 Nov 1967, Maguire & Maguire 61492 (NY); ♂, small tree 8 m high, latex moderate, white, sepals 2 pairs, white, pedicel white, petals white, ca 2.5 cm long, La Mesa, Cerro Gaital, 3 mi NW of El Valle, 9 Nov 1967, Maguire & Maguire 61493 (NY, unicate); shrub, fruits green, "Copey," cloud forest, 3000 ft elev, Cerro Pilon, El Valle, 4 Jan 1968, Duke & Lallathin 15024 (MO); Cerro Pilon, ca 2900 ft elev, Apr 1968, Lallathin 36-3 (MO); tree or epiphyte to 6 m, dbh 13 cm, leaves leathery, fruit green, latex yellow, El Valle site area of WEPOR, Cerro Pilon, 24 Apr 1968, Kirkbride 1059 (NY, MO); small tree, buds white, Cerro Pilon, foot of thicket near Mr. Furlong's farm, 11 Jan 1972, Gentry & Dwyer 3626 (MO, 2 sheets); epiphytic shrub, flowers white, hills above El Valle, tropical wet forest, ca 1000 m alt, 24 Dec 1972, Gentry 6905 (MO); tree, lactiferous, buds and petals white, La Mesa, 2200 ft alt, 4 Jan 1974, Dwyer & Nee 11945 (MO); petals white, cut-over cloud forest along farmer's road, ca 3 km NE of El Valle, 2 Nov 1974, Mori & Kallunki 2971 (MO); small or subscandent ♂ tree with whitish latex, petals white, occasional, margins of high bush, La Mesa, 6 km above El Valle, 18 Jan 1975, Maguire & Huang 65521 (holotype NY); small or subscandent ♀ tree with whitish latex, petals white, occasional, margins of high bush, La Mesa, 6 km above El Valle, 18 Jan 1975, Maguire & Huang 65522 (NY); small ♂ tree with whitish latex, petals white, occasional in margins of high bush, 7 km above El Valle from La Mesa, 18 Jan 1975, Maguire & Huang 65525 (NY). Prov. Panamá: tree 10 m, flowers pinkish-white, fragrant, Cerro Campana, 800 m alt, 7 Jan 1947, Allen 3960 (NY, MO); tree 15 m, fruits green, Cerro Campana, 800-1000 m alt, 3 Apr 1972, Gentry 4912 (NY, MO); tree 4.5 m tall, 8 cm dbh, petals white, along trail to top of Cerro Campana, 13 Oct 1974, Mori & Kallunki 2470 (MO). Prov. Veraguas: sap pale turning orange, small tree 2 m, 3.5-4.5 mi above Santa Fe, 13 Dec 1971, Gentry 3072 (MO); 5 m high, 5 cm dap, Alto Piedra

Santa Fe, 1200 m elev, 26 Enero 1972, Lao & Maasola 481 (MO).

Because of the morphology of the staminate flower, one is led to assign Clusia divaricata to the broader section of Euclusia as amplified by Engler². It remains clear, however, that sectional content and limitation within the genus must be reconsidered.

2. Clusia dukei Maguire, sp nov

Sectione non-designata.

Epiphytica vel arbor facultativa; ramulis teretibus, foliis petiolatis, petiolis tenuibus, 12-15 mm longis; laminis ellipticis, basibus et apicibus acutis vel acuminatis, vulgo 6-10 cm longis, vulgo 2-4 cm latis, papyraceis; venis lateralibus inconspicuis, ca 1.5-2.0 mm apartis; inflorescentiis evidentibus, vulgo unifloribus interdum trifloribus; floribus masculinis non bene cognitis: alabastris ca 5-6 mm diam, sepalis apparenter 4, decussatis; petalis non visis, staminibus numerosis, liberis, filamentis crassis, ca 1 mm longis, connectivo crasso, antheris lateralibus dehiscentibus, ca 2 mm longis; pollinibus subsphaeroideis, tricolporatis, minutis, ca 14-16 μ diam; inflorescentiis foemineis apparenter unifloribus: alabastris parvis, sepalis 4, floribus non-visis; fructibus elongato-oblongis, vulgo 4-6 cm longis, 2.0-2.5 cm latis, apice aliquantum sulcato-cornuto; stigmatibus 8, lateraliter affixis, aliquantum 5 per coalitis; ovario vulgo 8-loculari, multi-ovularibus; seminibus ca 4 mm longis.

Type. Epiphytic liana, fruits green, on Chiriqui Trail, cloud forest between Quebrada Hondo and Divide, Prov. Chiriquí, Panama, 20 Apr 1968, Joseph H. Kirkbride, Jr. & James A. Duke 958 (holotype MO).

Distribution. Localized in the cloud forests of the Horquete region of the Cordillera Central, Province of Chiriqué.

PANAMA. Prov. Chiriqué: tree 6 m, very common, Llano del Volcán, 1500 m alt, 27 May 1946, Allen 3503 (NY, MO); epiphytic, cruciately branching liana, latex scanty, sepals imbricate, green, fruit green, oblong, to 4 cm long, premontane rain forest between Pinola and Quebrada Hondo toward summit on Chiriquí Trail, 20 Apr 1968, Kirkbride & Duke 892 (MO, NY); epiphyte,

buds green, flowers tan-brown, tetramerous, caducous, mature fruit green with brown verrucae, ca 2 cm diam, on Chiriquí Trail, cloud forest between Quebrada Hondo and Divide, 20 Apr 1968, Kirkbride & Duke 931 (MO); epiphytic liana, fruits green, on Chiriquí Trail, cloud forest between Quebrada Hondo and Divide, 20 Apr 1968, Kirkbride & Duke 958 (holotype MO, isotype MO, NY).

3. Clusia erectistigma Maguire, sp nov

Frutex epiphyticus, plus saepe magnus; foliis chartaceis; petiolis tenuibus, 1.5-2.0 cm longis; laminis oblanceolatis, vulgo 10-15 cm longis, 4-7 cm latis, apicibus rotundatis, vel abrupte breviter obtuse acuminatis; basibus anguste acuminatis; venis primariis ca 3-4 mm apartis, ca 60° adscendentibus; inflorescentiis terminalibus, vulgo 3-5-floribus, ad 10 cm longis; pedicellis conspicue bracteatis; sepalis subpetaloideis, 3-jugis, late semi-orbicularibus, ad 12 mm latis, 8 mm longis, marginatis, interioribus late oblongis, ad 12 mm longis; petalis 5-6, panduriformibus, roseis, obovatis, 2.2-2.6 cm longis, vittatis; discis androecialibus anantheris, glutinosis; ovario 8-10-locularibus, multiovulatis, ovulis axialibus (lateraliter extensis); stigmatibus 8-10; fructibus ca 3.5 cm longis, late ovati-ovalibus, stigmatibus erectis introrsis, late oblongis, aliquantum truncatis, 3-4 mm longis, ca 2 mm latis; seminibus anguste oblongis, 4-5 mm longis, ca 1.5 mm latis, longitudinaliter punctato-striatis, carnosomembranaceo-arillatis; inflorescentiis masculinis recurvatis, vulgo 8-12-floribus; bracteis prominentibus; sepalis 2-jugis, suborbicularibus, coriaceis, ca 6-7 mm longis, marginatis; petalis 5, panduriformibus, unguibus, carminis, laminis carmino-maculatis; androecio viscido compacto; staminibus pluribus columnaribus, plus minusve crassis, antheris plerumque unis vel duobus, circularibus, distalibus immersis; pollinibus sphaeroideis, tricolporatis, ca 25 µ diam; pistillo destitudo.

Type. Massive epiphyte in large tree, latex yellow-brown, moderate, sepals 3 pairs, subpetaloid, white, green-tipped, pedicel white, petals 6, obovate, panduriform, ca 2.5 cm long, 10 mm broad, salmon pink, androecial ring ca 2-3 mm high, anantherous, glutinous, stigmas 9-10, styles initially rotate, at length suberect, Changuinola (United Fruit Company property), Bocas del Toro, Panama, 30 Oct 1967, Bassett Maguire & Celia K. Maguire 61473A (holotype NY). Paratype. In same tree as 61478♂, flowers 5-petaled, petals panduriform, the claw red, the blade red-maculate, common along sea drive ca 5 km from town of Bocas Colon Island, Bocas del Toro, Panama, 1 Nov 1967, Bassett Maguire & Celia K. Maguire 61479 (NY).

Distribution. Massive, apparently obligately epiphytic, Nicaragua to Darién, Panama.

PANAMA. Bocas del Toro: tree with vine-like habit growing around a large bole, Flat Rock, region of Almirante, Jan-Mar 1928, Cooper 562 (NY); Changuinola, 30 Oct 1967, Maguire & Maguire 61473A (holotype NY); fruiting material of 61473A, massive epiphyte in large tree, latex yellow-brown, moderate, Changuinola, 30 Oct 1967, Maguire & Maguire 61473B (NY, 2 sheets); epiphyte in large tree (Sapotaceae), latex yellow-brown, moderate, pedicels white, sepals 3 pairs, white with green tips, petals 5-6, panduriform-ovate, the margins particularly at the claw Chinese red, ca 18-20 mm long, 12-16 mm broad, probably ♂ of 61473, androecium pentagonal, glutinous, inflorescence 1-3-flowered, on United Fruit Company properties in Changuinola, 30 Oct 1967, Maguire & Maguire 61474 (NY); small tree, ♂, latex cream-white, on rocks in salt water spray, Almirante, 31 Oct 1967, Maguire & Maguire 61475 (NY); large epiphyte in mango, ♀, androecium exceedingly glutinous, latex cream-tan, pedicels white, stigmas 8-10, along Carretera Adolfo Chairi, 3 km from town of Bocas, Colon Island, 1 Nov 1967, Maguire & Maguire 61476 (NY); epiphyte, ♂, latex tan-brown, pedicels white, sepals 2 pairs, white with green tips, petals panduriform, ca 2 cm long, 16-18 mm broad, claw marginally red, limb red-maculate towards base, androecium highly glutinous, 5 km from town of Bocas, Colon Island, 1 Nov 1967, Maguire & Maguire 61477 (NY); in same tree as 61478, ♂, flowers 5-petaled, petals panduriform, the claw red, the blade red-maculate, common along sea drive ca 5 km from town of Bocas, Colon Island, 1 Nov 1967, Maguire & Maguire 61479 (paratype NY); epiphyte on sea grape, ♂, petals 4-5, 10 km from town of Bocas, on large crescent beach, Colon Island, 1 Nov 1967, Maguire & Maguire 61480 (NY). Colón: tree growing like strangler fig, buds pale pink, flowers white with red markings, between Río Piedras and Puerto Pilón, roadside, 11 Dec 1967, Lewis, Blackwell, Hawker, Oliver, Robyns & Verhoek 3224 (NY). Darién: small laticiferous epiphytic shrub, fruits green, "Coama" ?, forest near Pidiaque peak, 800-1000 ft alt, 31 Mar 1966, Duke 805 (NY); seems to be close to coll. of Clusia Sr. M.V. Hayden 141 from BCI, epiphyte, flowers white, latex more white than yellow, Río Chucunaque, between Río Membrillo and Río Yaviza, 23 Aug 1966, Duke 8619 (MO); vine which attaches itself to tree, but when grown has branches similar to those of the tree, green fruits with unpleasant scent and taste, vine contains some latex, too green to plant, Uruti River, Duke & Bristan 226 (MO, 2 sheets. Panamá, Canal Zone: along shore west of dock, tree 20 ft tall, Barro Colorado Island, 12 Jul 1960, Ebinger 389 (MO); tree to 40 ft, buds white flushed with pink, dense woods with man-made drainage ditches, Coco Solo, U.S. Army Tropic Test Center, Mine Emplacement Center, 13 Aug 1967, Dwyer & Duke 7913 (NY); shoreline on end of easternmost point of Peña Blanca Peninsula, tree 7 m, fruit green, Barro Colorado Island, 7 May 1968, Croat 5412 (MO).

NICARAGUA. Bluefields: Epiphytic shrub on large sterile Ficus, ♀, flowers 5-parted, pink, ♂ not seen, Finca Santa Rosa, ca 2.5 km ENE of Rama, pastures and old fields, sea level to 150 m alt, Rama and Vic Río Escondido, 5 Apr 1966, Proctor, Jones & Facey 27340 (NY, 2 sheets); epiphytic shrub on large sterile Ficus, ♀ not seen, pastures and old fields, Finca Santa Rosa, ca 2.5 km ENE of Rama, 5 Apr 1966, Proctor, Jones & Facey 27341 (NY, 2 sheets).

Clusia erectistigma is a well marked, conspicuous, widely distributed, massive epiphyte occurring in open places at lower altitudes from Nicaragua to Darién, Panama. For that reason it is amazing to me that records of the plant do not seem to be obviously on the record. It would, therefore, not be surprising to find that I have overlooked a published record of the species. Clusia erectistigma manifestly belongs to the C. minor complex.

4. Clusia cupulata Maguire, stat nov

Clusia salvinii Donn. Sm. var cupulata Maguire, PHYTOLOGIA 38: 212. 1978.

Even with more complete confirmation not yet at hand, and staminate material still lacking, the strong characterization of pistillate specimens requires the elevation of the var cupulata to specific status.

5. Clusia liesneri Maguire, sp nov

Frutex epiphyticus; ramulis tenuibus, teretibus; foliis brevi-petiolatis, petiolis tenuibus ca 1 cm longis; laminis chartaceis, oblanceolatis, vulgo 8-12 cm longis, vulgo 5-6 cm latis, apicibus rotundatis vel aliquantum abrupte brevi-acuminatis, basibus acutis; venis lateralibus prominulis, 60°-70° adscendentibus, vulgo 1.0-1.5 mm apartis; inflorescentiis terminalibus cymosis, masculinis: floribus 25-30, bracteis 1.5-2.0 mm longis, late ovatis; sepalis 6, decussatis, orbiculari-concavis, vix vittatis, in alabastro 5-6 mm longis; petalis 5(6), in alabastro valde vittatis; androecio cum antheris basilaribus, uniseriatis, circularibus, immersis, ca 0.5-0.6 mm longis, staminodiis centralibus, grandis, 6-partitis, plus minusve coalescentibus, vulgo unquoque cum anthera solitaria immersa; granis pollinis immaturis parvis, tricolporatis, plus minusve sphaeroideis, ca 20 u diam, ut videtur interdum pistillo abortivo centrali; floribus foemineis et fructibus non visis.

Type. Epiphytic shrub, primary forest along newly cut road from El Llano to Carti-Tupile, Continental Divide, to 1 mi from

Divide, at 300-500 m alt, Prov. Panamá, Panama, 30 Mar 1973, R. L. Liesner 1273 (holotype MO).

Distribution. Apparently known only from the type locality. PANAMA. Prov. Panamá: epiphytic shrub, flower buds pinkish, road to Carti [San Blas], 19 km n of El Llano, alt ca 500 m, 13 Mar 1973, Busey 904 (MO, NY); 300-500 m, 30 Mar 1973, Liesner 1273 (holotype MO, isotype NY); buds pink and white, premontane wet forest along El Llano-Carti road, 16-18-1/2 km by road north of Pan American Highway at El Llano, ca 400-450 m alt, 28 Mar 1974, Nee & Tyson 10972 (MO).

Only staminate material of this most interesting, highly distinctive species of Clusia has come to my hands. It is essential to revisit the Cerro Jefe-Llano area for competent observation and collection of Cl. liesneri. Mid- or late-April or May could be a productive period.

Since other insufficiently known and inadequately collected species of the genus are also to be found in the same area, an effective field excursion, or series of them, to this critical area would be most rewarding.

No assignment to section is made at this time, but this plant may be closely allied to Cl. odorata which has a similar androecial apparatus.

6. Clusia minor L. Sp. Pl. 510. 1753.

Type locality. "America meridionali."

Distribution. Epiphytes or shrubs. Central America from tropical Mexico southward; the West Indies; tropical South America to the Guianas, Venezuela and Colombia; probably southward.

The assemblages assigned to C. minor and their immediate putative relatives historically and contemporarily have been and are biologically and taxonomically little understood. Planchon & Triana³, under "Species floribus foem. tantum notis, in

sectione subdubiae" associated Cl. minor with the names Cl. plumieri Pl. & Tr. of Santo Domingo, Cl. odorata Seem. of Panama, and Cl. rosaeflora Pl. & Lind. of Venezuela.

Vesque⁴ some thirty years later also placed Cl. minor in "Species androecei ignoto in sectione subdubiae", p 95, associating this name, as did Planchon & Triana, with Cl. plumieri, Cl. odorata, and Cl. rosaeflora, and added two more, Cl. cartilaginosa attributed to the Dominican Republic, and Cl. parvicapsula, Mexico and Colombia.

Since that time in 1922 Blake⁵ added Clusia utilis, Lake Izabal, Guatemala, to the assemblage listed above.

Recently I⁶ published notes drawing attention to the prevailing condition of apomixis in two complexes going under the names of Clusia rosea and Cl. minor. Of the two, Cl. minor has developed a greater series of phenotypic races, and, besides forming apomictic races, is reproductively more complicated in that in certain forms it produces plants with hermaphrodite flowers, and may also follow the normal dioecious pattern generally prevailing in the genus Clusia.

In this last role Clusia minor is similar in appearance to Cl. odorata, is often confused with it, and may well be inseparable from and be a part of it.

Assigned here to Clusia minor as an apomictic race without a name is a handsome shrub or small tree common at lower to middle altitudes (400-600 m) in the Provinces of Chiriquí, Veraguas, Coclé, Herrera, and Panamá. This race is similar to and may be a part of the apomictic form represented by Cl. utilis Blake of Guatemala. Both have frequently been associated with Cl. odorata.

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DC Monograph. Phanerogam. 8: 95-101. 1893

5

Contr. U. S. Nat. Herb. 24: 14, pl 4. 1922.

6

Maguire, B. Apomixis in the Genus Clusia. TAXON 25:
241-244. 1976

Typical collections of it from Panama are: Chiriquí: Boquete, Maguire & Maguire 61470; Citricos, Maguire 60210, 60211; San Felix, Mori & Kallunki 6025; Santa Ana Well, Dwyer & Kirkbride 7459. Coclé: Valle, Dwyer 8364, 8278; Valle, Maguire & Maguire 61507, 61508, 61486, 61491. Veraguas: Santa Fe, Nee 8030 (provided with prominent sterile androecial ring), Nee 10142; Maguire & Huang 65514.

To the north in Nicaragua there is a depressed, small-leaved apomictic shrubby race which acts as a true pioneer on recent lava fields. A broad-leaved form is dominant in upper subxeric slopes of the Venezuelan Andes. A careful field survey throughout its entire range would undoubtedly reveal numerous such apomictic races exhibiting the full range of habit forms. The detection of these races in the field would be much simpler than in the herbaria.

No attempt is here made to resolve the complicated biological and taxonomic problems attendant on the correct and formal assignment of specimens to any apomictic or sexually reproducing races or categories within the Clusia minor-Cl. odorata complex. Any previous such assignment made by me should be held suspect.

7. Clusia oedematopoidea Maguire, sp nov

Liana lignosa; laminis petiolatis, petiolis tenuibus, 2-3 mm longis; laminis pallidis, coriaceis, oblongis, vulgo 10-18 cm longis, 5-8 cm latis, acuminatis, acumene vulgo 10-15 mm longo; nervis primariis improminulis, vulgo 4-6 mm apartis; inflorescentiis multifloribus, terminalibus: masculinis ad 10 cm longis, floribus subglomeratis; sepalis 5-6-jugis, suborbicularibus, interioribus concavis, ad 6 mm longis; petalis non visis; staminibus liberis, introrsis, plus minusve 15-20, filamentis brevibus, ca 0.2 mm longis, stipitato androbasi affixis; antheris oblongis ca 1 mm longis, thecis lateralibus, connectivo prominenti, non-producto; floribus foemineis non-visis; fructibus immaturis, 5-locularibus, lineari-oblongis, ad 3 cm longis, stylis brevioratis, subcornutis, stigmatibus obovato-deltaideis; seminibus non-visis.

Type. Vine, fruits brownish-maroon, Rio Balsa, between Manene and Tusijuanda, 26 Jul 1967, J. A. Duke 13557 (holotype NY), Darién, Panama.

Distribution. Said to be a vine, habitat not indicated, and apparently narrowly restricted.

PANAMA. Prov. Darién: subscandent, Rio Balsa between Rio Areti and Manane, 14 Sept 1966, Duke 8780 (MO, NY); vine, fruits brownish-maroon, Rio Balsa between Manene and Tusijuanda, 26 Jul 1967, Duke 13557 (holotype NY, isotypes MO, NY); vine, buds green, Rio Balsa between Manene and Guayabo, 8 Nov 1967, Duke & Nickerson 14938 (MO); vine, buds cream color, Manene to mouth of Rio Cuasi, 28 Apr 1968, Kirkbride & Bristan 1445 (MO).

A most interesting, well marked species of obviously very narrow endemism, characterized in facies by its form, pale oblong acuminate leaves with broadly spaced improminulous lateral veins, conspicuous inflorescence, oedematopus-like anthers, and narrowly elongate 5-celled capsules. No section is here assigned. More material is needed. Mori & Kallunki 4674♀, a look-alike but specifically distinct, is for convenience fitted here. Hemiepiphytic liana, in wet forest, 350 m alt, El Llano-Carti Road, 12 km from Inter-American Hwy, 15 Feb 1975, Prov. Panama, Mori, Kallunki & Gentry 4674 (MO).

8. Clusia osseocarpa Maguire, sp nov

Arbor parva vel epiphytica, ad 4 m alta; ramulis teretibus; foliis petiolatis, petiolis 1-4 cm longis, teretibus, foveis petiolarum plus minusve conspicuis; laminis coriaceis, vulgo 6-10 cm longis, 4-12 cm latis, late ovalibus vel suborbiculari-orbicularibus, apice late rotundatis, basibus late obtusis vel abrupte brevi-acutis, venis primariis ad 50° adscendentibus, ca 1.5-3.0 mm apartis; inflorescentiis terminalibus, masculinis non visis; foemineis cymosis, brevibus, ad 3-4 cm longis, congestis; floribus non-visis, alabastris parvis immaturis cum 4 sepalis, decussatis, ca 2 mm longis, concavis, abrupte acutis, bracteis carinatis, acutis; capsulis late ellipsoidalibus, ca 1.5 cm longis, valde 4-porcatis in suturis carpellorum, 4-ocularibus, loculis bispermis; endocarpo prominenter sclero-indurato; stigmatibus 4, parvis, sessilibus, ca 0.5 mm longis; seminibus lineari-oblongis, ca 4 mm longis, 1.5 mm latis, striatis, in sacco membranaceis complete involvis.

Type. Epiphyte, primary forest along newly cut road from El Llano to Carti-Tupile, Continental Divide to 1 mi from Divide, 300-500 m alt, San Blas, Panama, 30 Mar 1973, R. L. Liesner 1285 (holotype MO).

Distribution. Known certainly by the following three collections. PANAMA. Prov. Panamá: east slopes of Cerro Jefe at 2700 ft, in "Clusia" cloud forest, 10 ft tall, 8 Feb 1966, Tyson 3438 (MO, 2 sheets); El Llano-Carti-Tupile Road, Liesner 1285 (holotype MO, isotype NY); tree 7 m tall, 18 cm dbh, young

fruit and buds present, at base of last hill on road to Cerro Jefe, 23 Oct 1974, Mori & Kallunki 2769 (syntype MO).

The three collections, all with mature fruit, present a problem that is not satisfactorily resolved here. The fruit represents the extreme, so far observed within the genus, in the development of endocarp (1.5 mm thick) consisting of sclerenchymatous bony tissue, possibly of stone cells. In the section Omphalanthera, Clusia columnaris and relatives, a similar but thinner endocarp is formed.

9. Clusia rosea Jacquin, Enum. Syst. Pl. 34. 1760.

Distribution. A moderate-sized tree. Central America from Yucatán, Mexico, to the Panama Isthmus; the Greater Antilles.

The type locality of Clusia rosea is the antillean island of Hispaniola⁷, probably the Dominican Republic. There it exhibits two more or less transitory habital forms (Maguire, B. Apomixis in the Genus Clusia (Clusiaceae), TAXON 25: 241-244. 1976), one coastal at sea level, and the other interior and upland. Probably the habital differences reflect immediate environment.

In Panama (and apparently elsewhere in Central America) Cl. rosea is represented by an upland form, a handsome, large, single-boled tree, where it may indeed become one of the largest of the genus.

It may, at some later time when the species is reviewed throughout its Central American-Antillean range, be necessary to review taxo-apomictic forms, but that need does not yet seem to be required.

Distribution. Selected collections. PANAMA. Prov. Chiriquí: 8 Jan 1967, Maguire 60209 (NY); 6 Nov 1967, Maguire & Maguire 61485 (NY). Prov. Coclé: 8 Nov 1967, Maguire & Maguire 61489 (NY); 10 Nov 1967, Maguire & Maguire 61505 (NY). Prov. Veraguas: 16 Jan 1975, Maguire & Huang 65515 (NY).

Howard, R. A. The Enumeratio and Selectarum of Nicolaus von Jacquin. Jour. Arnold Arb. 54: 447. 1973.

10. Tovomita morii Maguire, sp nov

Frutex epiphyticus; ramulis teretibus, grossis; petiolis brevissimis vel foliis subsessilibus; laminis late oblanceolatis, firme chartaceis vel subcoriaceis, vulgo 18-25 cm longis, 10-14 cm latis, apicibus vulgo acutiusculis, basibus acutiusculis vel aliquantum subcordatis, venis primariis prominentibus, lateralibus, 12-18 mm apartis, non-ramosis, ad 45° adscendentibus, venis secundariis transverse subreticulatis; inflorescentiis pauci-floribus, pedicellis demum multo incrassatis; sepalis 4, decussatis, exterioribus interioribus excedentibus et inclusis, ovato-oblongis, 10-12 mm longis, subcoriaceis; petalis non-visis; staminibus 3-serialibus, liberis, linearibus, sublaterali-compressis, 3.5-4.0 mm longis, ca 0.5 mm latis; antheris distalter lateralibus, ca 1 mm longis; polline non-viso; ovario 5-loculari, ovulis in loculis solitariis, basalter affixis; staminibus 5, obovatis, rotatis; capsulis globosis, 4-5 cm longis, externe conspicue brunneo-verrucosis, oblongis, ca 2 cm latis.

Type Epiphytic shrub? Fruit brown, leaves and fruit with sticky yellow sap, El Llano-Carti Road, 12.7 km from Inter-American Highway, wet forest at 350 m alt, Prov. Panamá, Panama, 15 Feb 1975, S. Mori, J. Kallunki & A. Gentry 4685 (holotype MO, isotype NY).

In addition to the two type specimens, I have before me a single specimen, Busey 370 (MO), also collected in the Carti Road, Km. 15.5, north of El Llano, 13 Feb 1973.

Tovomita morii is a well marked species belonging to the T. macrophylla-T. speciosa-T. calodictyos complex of the Amazon Basin and the Guianas. These names represent a closely inter-related series which requires more study. Our species is distinguished from them by the near sessile leaves and short, subpeltate stigmas.

11. Tovomita froesii Maguire, sp nov

Foliis ellipticis, 25-30 cm longis, 10-15 cm latis, firme chartaceis, apicibus basibusque acutis, venis primariis prominentibus, lateralibus, 12-18 mm apartis, non-ramosis, ad 30-45° adscendentibus; venis secundariis transverse subreticulatis; inflorescentiis non-visis; floribus non-visis; pedicellis incrassatis, brevibus, ca 6 mm longis; fructibus depresso-globularibus, 6-spermis; stylo anguste conico, ad basem valde sulcato.

Type. Shrub $\frac{1}{4}$ m, swampy land, high central forest, Upper Jandiatuba, Estado Amazonia, 12 Jan 1949, R. L. Fróes 23247 (holotype NY). Known only by the type collection.

The relationship of Tovomita froesii lies with the T. macrophylla complex (including Tovomitidium), the members of which are Amazonian or Guianan. Only T. morii, offered above, occupies a disjunct range.

* * * * *

This brief paper brings to conclusion my preliminary report on some Clusiaceae of Panama. As has been several times expressed in this short series, despite diligent field work, collected material is yet inadequate for a thoughtful understanding of the family in Panama. More specific and correlative field observations must be made in certain critical areas within the country before an adequate interpretation can be made of a number of taxa of the family.

Any further assay into the mid-American floristics of the Clusiaceae would respond more satisfactorily to a comprehensive study of the entire phytogeographically cohesive region.

ADDITIONAL NOTES ON THE GENUS LIPPIA. VII

Harold N. Moldenke

LIPPIA GRACILIS Schau.

Additional bibliography: Moldenke, *Phytologia* 39: 45 & 46. 1978.

Peckolt (1904) records this species from Alagoas, Bahia, and Pernambuco, Brazil, with the vernacular name "chumby". He says of it: "Pflanze mit oval-länglichen, gekerbten, filzigen Blättern und kleinen, weissen Blüten. Blätter von thymianähnlichen Geruch, als Tee und Sirup bei Lungen- und Bronchialkatarrh Gilt beim Volke als Spezifikum bei Keuchhusten".

The type collection of this species was made by Martius "in camporum sepibus ad Joazeiro, Apr.", in Bahia, Brazil, and is deposited in the Munich herbarium. The handwritten label and Schauer (1847) give "Bahia et Pernambuco" as the locality of collection, so the collection may well consist of material from two separate localities. The printed labels accompanying Lützelsburg 1466 in the Munich herbarium indicate "Piauy" as the state in which the collection was made, but in ink is inscribed "Matto Grosso". The printed word is not crossed out, but I assume that the inked in words are the more reliable and that the material actually came from Matto Grosso.

Material of L. gracilis has been misidentified and distributed in some herbaria as L. microphylla Cham. On the other hand, the Irwin, Maxwell, & Wasshausen 19579, distributed as L. gracilis, actually represents L. glandulosa Schau., while Anderson, Stieber, & Kirkbride 35371 is the type collection of L. pohliana var. longibracteolata Moldenke.

Additional citations: BRAZIL: Bahia: Davidse, Ramamoorthy, & Vital 11763 (Ld, N, N), 11963 (Ld), 12070 (Z); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15158 (Ld), 16269 (Gz), 16390 (Ld), 16444 (Tu); Irwin, Grear, Souza, & Reis dos Santos 14786 (Ld, N), 14925 (Ac, N); Martius s.n. [in camporum sepibus ad Joazeiro, Apr.; Macbride photos 20325] (Mu—43—type, Z—iso-type). Espirito Santo: W. Hoehne 5549 (N). Goiás: G. Gardner 4332 (M). Maranhão: Eiten & Eiten 4492 (N, W—2445202), 10807 (N, W—2757760). Mato Grosso: Lützelsburg 1466 (Mu, Mu, Z). Pernambuco: Kubitzki 71-88 (Mu).

LIPPIA GRANDIFLORA Mart. & Schau.

Additional synonymy: Eriope horridula Epling in Fedde, Repert. Spec. Nov. Beih. 85: 191. 1936.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, *Phytologia* 13: 354. 1966; Moldenke, Fifth Summ. 1: 155 (1971) and 2: 555 & 891. 1971; Harley, Kew Bull. 28: 121—122. 1973; M. Gilbert, Biol. Abstr. 57: 4423. 1974; Moldenke, *Phytolo-*

gia 28: 457 (1974) and 39: 43. 1978.

Recent collectors comment on the fact that this species produces a definite xylopodium. Irwin and his associates describe it as "sessile, leafless from [a] thick woody root, to 5 cm. tall". The corollas are said to have been "rose" on Hatschbach & Kummrow 37130, "deep-rose" on Hatschbach & Kummrow 34929, "dark-lilac" on Hatschbach 39118, and "light lavender-violet, throat yellow" on Irwin & al. 8171. It has been found growing in cerrado, burned-over cerrado, and "campo limpo", while Hatschbach encountered it on "cerrado recém queimado". It has been found growing at 975 meters altitude, flowering in September and October, and fruiting in September.

According to Harley (1973), Epling (1936) cites Burchell 7921, 7922, 8291, 8426-5 (the type collection), and 8746-2 and Glaziou 21947 as representing Eriope horridula Epling. He comments: "As in many species of Eriope, the stems and leaves of E. horridula bear long spreading setae. A microscopic examination of these reveal[s] that while those of other Eriope species are multicellular, as in most other Labiatae, those of E. horridula appear to be unicellular and quite different in structure. The latter closely resemble the setose hairs of some Lippia species, especially L. grandiflora Mart. & Schauer and L. lasiocalycina Cham. All except one of the collections cites under E. horridula closely match the type in general appearance and share with it the unicellular setose hairs. The exception is Burchell 7922, which possesses typical multicellular setae and in other respects also seems to be merely a depauperate, sterile specimen of Eriope crassipes Benth.

"An examination of herbarium material of Lippia at Kew produced a specimen from Goiás, Glaziou 21892, which shows striking resemblance in its sterile shoots to those of Eriope horridula. The sheet contains four specimens, two sterile shoots, and two fertile plants which bear typical heads of Lippia flowers and small leaves quite different from those on the sterile stems. The plant seems to be a precocious flowering species in which the mature shoots are developed late. This gathering has been cited tentatively by Moldenke in his monograph of Lippia as Lippia grandiflora, though there is no evidence that he actually examined the Kew sheet. More recently, however, in 1967, the same sheet has been annotated as this species by Troncoso, who is currently working on S. American members of this genus.

"While there seems no doubt that Eriope horridula is, in fact, a species of Lippia, and that the sterile shoots of Glaziou 21892 belong to the same species, there still seems room for doubt that this species is L. grandiflora or even that the Glaziou gathering is not a mixed one. All other collections referred to this species, including the type, consist only of fertile material, bearing few, small, ovate leaves with crenate-serrate teeth and dense-

ly hairy on both surfaces. The leaves of Eriope horridula and of the sterile shoots of Glaziou 21892 are several times longer, narrowly elliptic to linear with salient teeth and glabrous, except for a few scattered setae and numerous sessile glands. They are not unlike the leaves on some specimens at Kew determined as L. lasiocalycina. Material of this species at Kew is very heterogeneous, and some sort of taxonomic revision is obviously needed. Most specimens suggest a much taller more shrubby plant than L. grandiflora, flowering at some height above the ground, though a sheet determined as this by Moldenke suggests that precocious flowering at ground level is possible. The ability to flower almost at ground level, usually as a response to frequent burning, is common to many cerrado species in Brazil, and as it may result in modification to various vegetative characters taxonomic confusion sometimes occurs. It seems possible that this may have happened here."

The Lützelburg 388 & 1360, distributed as L. grandiflora, actually are L. francensis Moldenke, Irwin, Souza, & Reis dos Santos 7900 is L. lepida Moldenke, while Irwin, Souza, & Reis dos Santos 8577, Lützelburg 1465a, and Maguire, Murça Pires, Maguire, & Silva 56346 are L. primulina var. goyazensis S. Moore.

Additional citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 8171 (Ac, N). Goiás: Hatschbach 39118 (Z). Minas Gerais: Hatschbach & Kummrow 34929 (Ld), 37130 (Z); Martius 1571 [Macbride photos 20326] (Mu—type, Z—isotype).

LIPPIA GRANDIFOLIA Hochst.

Additional & emended synonymy: Lippia adoensis R. E. Fr. apud Robyns, Fl. Sperm. Parc Nat. Albert 2: 138, in syn. 1947 [not L. adoensis Hochst., 1845, nor L. adoënsis Hochst., 1841, nor "sensu Hutch. & Dalz.", 1963]. Lippia grandifolia "Hochst. ex A. Rich." apud Snowden, Grass Comm. & Mtn. Veg. Uganda 94. 1953.

Additional bibliography: Schau. in A. DC., Prodr. 11: 579. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; J. G. Baker in Thiseitl.-Dyer, Fl. Trop. Afr. 5: 278 & 280—281. 1900; Almagia in Pirotta, Fl. Col. Erit. [Ann. Inst. Bot. Roma 8:] 132--133. 1903; Snowden, Grass Comm. & Mtn. Veg. Uganda 20, 54, & 94. 1953; Dale & Greenway, Kenya Trees 588. 1961; Lind & Tallantire, Some Com. Flow. Pl. Uganda, ed. 1, 146, 147, 243, 254, 257, & 258. 1962; Moldenke, Phytologia 14: 406--407. 1967; Moldenke, Résumé Suppl. 16: 8. 1968; Drar, Publ. Cairo Univ. Herb. 3: 110. 1970; Lind & Tallantire, Some Com. Flow. Pl. Uganda, ed. 2, 146, 147, 243, 254, 257, & 258. 1971; Moldenke, Fifth Summ. 1: 211, 213, 230, 233, & 234 (1971) and 2: 549 & 891. 1971; Lewalle, Bull. Jard. Nat. Belg. 42 [Trav. Univ. Off. Bujumb. Fac. Sci. C.20]: [231]. 1972; Moldenke, Phytologia 23: 421 & 433 (1972) and 38: 263 & 266. 1978.

Recent collectors describe this plant as a subshrub, 1--1.75 m. tall, of strict habit, mostly unbranched at base, the leaves aro-

matic when crushed, and have found it growing on savannas at 1000-1800 m. altitude, flowering in January and May, fruiting in January. Snowden encountered it in Cymbopogon afronardus grassland on exposed and stony slopes and in Hyparrhenia cymbaria grassland with good humus in Uganda. The corollas are said to have been "white" on Meyer 7900 and "yellowish-green" on Ofermain 6951. Vernacular names recorded for it are "olugumaguma", "omushara-nkanda", and "omuzira-kironda". On Lewalle 620 there is a notation: "fls. blanches à coeur jaune, entomophiles".

Lind & Tallantire (1962) describe this plant as "A woody herb or small shrub up to 1.8 m. high. Stem slightly rough. Leaves in groups of three or four, smelling. Flowers white, with a yellow throat, in dense, stalked, rounded to elongated heads, three to five or more heads in the axils of each whorl of leaves. Fruit not fleshy. Grassland."

Almagia (1903) says of "T. P. n. 1851", which he calls "Lippia sp. nova?": "L'esemplare da me esaminato si avvicinerrebbe, par avere i capolini subsessili, alla Lippia grandifolia....che con Richard.....ritengo veramente diversa dalla Lippia adoënsis,.... con cui la fa sinonimo Schauer.....Differisce però dall'una e dall'altra: dalla L. adoënsis per le foglie più grandi, per i capolini quasi sessili e compatti e per le foglie ascellanti di essi, più piccole delle ordinarie; dalla L. grandifolia per essere i capolini non disposti in una specie di lunga spiga icontani tra loro e quasi prive di foglie ascellanti".

The second edition of Lind & Tallantire (1971) is sometimes cited with "1972" as the publication date, but on what basis is not obvious to me. The L. adoënsis sensu Hutch. & Dalz., referred to above, is a synonym of L. savoryi Meikle.

Lewalle (1972) cites his no. 620 from Burundi. Drar (1970) cites Drar & Mahdi 1232, 1690, & 1821 from Bahr al Ghazal, Sudan, but their no. 1821 is not verbenaceous. Tanner R.T. 4032, distributed as L. grandifolia, is L. abyssinica (Otto & Dietr.) Cuf.

Additional citations: SUDAN: Bahr al Ghazal: Drar & Mahdi 1232 (Gz), 1690 (Gz). ETHIOPIA: F. G. Meyer 7900 (W-2520112); Schimper 734 (Mu-2-isotype). ZAIRE: Ofermain 6951 (Mu). BURUNDI: Lewalle 620 (Z), 2361 (Ac).

LIPPIA GRANDIFOLIA var. ANGUSTISPICATA Moldenke

Additional bibliography: Moldenke, Phytologia 12: 177. 1965; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 891. 1971.

LIPPIA GRANDIFOLIA var. LONGIPEDUNCULATA Moldenke

Additional bibliography: Moldenke, Phytologia 12: 177-178. 1965; Moldenke, Fifth Summ. 1: 230 & 234 (1971) and 2: 891. 1971.

LIPPIA GRATA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266.

1858; Moldenke, *Phytologia* 13: 354. 1966; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 891. 1971.

Pereira describes this plant as a shrub, 2 m. tall, with white flowers, and found it in flower in January.

Material of this species has been misidentified and distributed in some herbaria as L. salviaefolia Cham.

Additional citations: BRAZIL: Bahia: Martius s.n. [Villa Novo da Rainho; Macbride photos 20327] (Mu—45—type, Z—isotype); E. Pereira 9765 [Pabst 8654; Herb. Brad. 35121] (Mu, Mu, N).

LIPPIA GRAVEOLENS H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 215—216. 1817.

Additional & emended synonymy: Lippia tomentosa Sessé & Moc. ex Moldenke, Prelim. Alph. List Inv. Names 32, in syn. 1940 [not L. tomentosa L. f., 1975]. Lantana graveolens Crutchfield & Johnston ex Moldenke, *Phytologia* 13: 354, in syn. 1966. Lippia berlandieria Schau. apud Uphof, Dict. Econ. Pl., ed. 2, 315, sphalm. 1968. Lippia berlandieri Schlecht. ex Marroquin, Cuad. Inst. Invest. Cient. 14: 56. 1968. Goniostachyum graveolens Small apud Gibson, Fieldiana Bot. 24 (9): 211, in syn. 1970. Lippica graveolens R. F. Sm. ex Moldenke, Fifth Summ. 2: 568, in syn. 1971. Lippia graveolens (H.B.K.) Small ex Moldenke, Fifth Summ. 1: 555, in syn. 1971. Lippia berlandieri DC. ex Moldenke, *Phytologia* 34: 275, in syn. 1976. Lantana graveoleus Crutchfield & Johnston ex Moldenke, *Phytologia* 36: 43, in syn. 1977.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 215—216 (1817) and ed. quarto, 2: 266—267. 1818; Schau., *Linnaea* 20: 479. 1847; Schau. in A. DC., Prodr. 11: 575—576 & 608. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 253, 265, & 266. 1858; S. Wats., Proc. Am. Acad. 24: 67. 1889; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Loes., Verh. Bot. Ver. Brand. 53 [Abhandl. 241]: 76—77. 1912; Roys, Ethno-bot. Maya [Tulane Univ. Mid. Am. Res. Ser. Publ. 2:] 214 & 322. 1931; M. Martínez, Pl. Medic. Mex., ed. 1, 296, 428, & 621. 1933; Parks, Tex. Agr. Exp. Sta. Bull. 155: 111. 1937; M. Martínez, Pl. Medic. Mex., ed. 2, 304, 429, & 608 (1939) and ed. 4. 1959; Hocking, Excerpt. Bot. A. 10: 271 (1966), A.11: 103 (1967), and A.12: 423. 1967; P. Gray, Dict. Biol. Sci. 365. 1967; Grieve, Modern Herb. 486. 1967; Moldenke, *Phytologia* 14: 403 & 407. 1967; Puig, Bull. Soc. Hist. Nat. Toulouse 103: 310. 1967; Burlage, Ind. Pl. Tex. 183, 199, 230, & 242. 1968; Marroquin, Cuad. Inst. Invest. Cient. 14: 56. 1968; J. F. Morton, Econ. Bot. 22: 97. 1968; Uphof, Dict. Econ. Pl., ed. 2, 315. 1968; M. Martínez, Pl. Medic. Mex., ed. 5, 464 & 639. 1969; Rickett, Wild Fls. U. S. 3 (2): 366. 1969; Rosengarten, Book Spices 276 & 278. 1969; Stahl, Skarzynski, & Voelker, Journ. Assoc. Offic. Anal. Chem. 52: 1184—1189. 1969; G. W. Thomas, Tex. Pl. Ecol. Summ. 77. 1969; Anon., Biol. Abstr. 51: 8675. 1970; Correll & Johnston, Man. Vasc. Pl. Tec. [Contrib. Tex. Res. Found. Bot. 6:] 1834, 1841, 1849, 1862, & 1873. 1970; El-Gazzar & Wats.,

New Phytol. 69: 483 & 485. 1970; Gibson, Fieldiana Bot. 24 (9): 207 & 211. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1330 & 1331. 1970; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 69. 1971; Moldenke, Fifth Summ. 1: 55, 61, 72, 77, 80, 83, 86, 88, & 366 (1971) and 2: 525, 527, 539, 542, 550, 551, 554-556, 566-568, & 891. 1971; Farnsworth, Pharmacog. Titles 7 (10): ix. 1972; Fong, Trajánkova, Trojánek, & Farnsworth, Lloydia 39: 147. 1972; Heath, Trop. Sci. 14: 251. 1972; Moldenke, Phytologia 23: 432. 1972; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Moldenke, Phytologia 28: 432 (1974) and 31: 378. 1975; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [72]. 1975; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 75. 1975; Moldenke, Phytologia 34: 252 & 275 (1976), 36: 43 (1977), 38: 386, 390, 396, & 398 (1978), and 39: 24. 1978.

Additional illustrations: M. Martínez, Pl. Medic. Mex., ed. 1, 429 [as L. origanoides] (1933), ed. 2, 429 (1939), and ed. 5, 464. 1969; Rosengarten, Book Spices 278. 1969.

Recent collectors describe this plant as a perennial herb, bush, or small shrub, 0.7-3 m. tall, "1 foot wide", slender, erect, strong-scented or aromatic with a mint-like odor, the leaves light-green above, gray-green beneath, aromatic with a cinnamon-like odor, the flowers showy, very fragrant, the calyx light-yellow (Lord & McComas 621), and the anthers yellow. They have found it growing in sandy loam, fine sandy silt, gravel, or gravelly soil, in rocky clay soil, on yellowish sandstone, and on limestones hills and mesas, as well as in brush-lands, deserts, gullies, heavy loam in sunlight, shrubby secondgrowth, and adjacent to "milpas", along arroyos and rocky clay roadsides, in arid to semi-arid thorn forests on low hills, in thin soil on arid slopes on a rocky substrate, on rocky clay banks, steep hillsides and bluffs, in massive caliche-base on dry gravelly hills, in desert washes, rocky limestone loam of disturbed areas, xerophilous matorral, rough desolate limestone country, and deciduous tropical woods. They have also reported it from hillsides, dry rocky hillsides, the banks of rocky open canyons, pine forests, grassy hills, the foot of exposed gypsum faces, and heavily eroded hills of a loose limey soil covered with Acacia-mesquite grassland, as well as among low spiny vegetation and in thick underbrush woodland associated with oak, pine, and juniper and in semi-arid areas with steep slopes in rolling hills or thorn scrub and oaks.

Johnston found the species growing among "broken rock along [a] dike through tuff-flats", while Johnston & Muller report it "not common on banks of rocky open canyons", but "frequent about limestone ledges on hillsides" and "on arid limestone ledges with Hechtia". Tharp & Johnston encountered it "on ridges of calichified fine sandy loam in short-brush with much guajillo and black-brush". Messer avers that it "grows well in disturbed areas of high elevation on semi-arid foothills with vegetation of cacti, shrubs, and small trees". McVaugh found it "abundant among shrubs in deep ravines, desert flats, and steep eroded slopes with

Larrea, Fouquieria, Opuntia, Karwinskia, and Prosopis". Blassingame and his associates encountered it "on canyon walls and floors in limestone, shale, and sandy wash", the Davidsees "on limestone rock outcrops with low shrubs and Yucca", and Webster and his associates "in woods of Acacia, Quercus, Garrya, Juniperus, etc. on limestone hills.

The Dunns found L. graveolens growing "with numerous species of Bursera, Bombax, Ceiba, Ipomoea trees, and Opuntia on very rocky limestone slopes"; Molina reports it "frequent", "common", or "abundant in arid scrub forests"; Hernández & Cadillot also report it "abundant". Johnston & Muller refer to it as "common" in Coahuila, but "not common" on the Coahuila-Chihuahua border. Webster and his associates encountered it in "semi-evergreen thorn-scrub of Acacia, Agave, Bursera, Sabal, etc. on limestone slopes"; Mears found it growing with Acacia, Opuntia, and Yucca, while Chiang and his associates met with it "on rhyolite hill-sides badly overbrowsed by goats in thin, dark, sandy, and grassy soil derived from igneous rocks with Agave lecheguilla, Mimosa, etc."

González Quintero reports the species from "mezquital alterado", desert matorral with Flourensia resinosa, matorral of Bursera and Plumeria, and "ladera de roca cristalina" with matorral vegetation of Prosopis, Myrtillocactus, Agave, Opuntia, and Eysenhardtia. Rzedowski found it on "slopes of igneous rock with secondary pastizal vegetation surrounded by deciduous tropical forest", in tropical deciduous forests "sobre ladera caliza", on "ladera caliza con vegetación de bosque abierto de Quercus, Pinus y Bursera" or "con Helietta parvifolia" or on "ladera riolítica con vegetación de encinar con Ceiba, Dodonaea y gramíneas". He reports it scarce in Guerrero. Runyon found it "infrequent" in Brewster County, Texas, but "common on gravel-hills" in Starr County.

Henrickson reports the species "common in limestone alluvial plain with Agave, Cordia, Larrea, Eysenhardtia, Jatropha, Buddleia, etc.", "infrequent along margins of arroyos in sandy clay soil with Larrea, Acacia, Prosopis, Parthenium, Bahia, Hilaria, Opuntia, etc.", "infrequent in open Chihuahuan Desert scrub in small arroyos with Larrea, Flourensia, Acacia, Jatropha, Grusonia, Fouquieria, Cordia, etc.", "in open Chihuahuan Desert with rocky reddish soil with Larrea, Acacia, Flourensia, Buddleia, Opuntia, Jatropha, and numerous annuals", "frequent along roads on canyon sides with Larrea, Acacia berlandieri, Hechtia, Viguiera, Yucca, Cordia, Croton, etc.", "frequent on west-facing shale slopes with Larrea, Selinocarpus, Grusonia, Agave lecheguilla, Tecoma, etc.", "infrequent in limestone canyons in Tamaulepian-like scrub with Quercus, Rhus, Prunus, Cercocarpus, Ceanothus, etc.", "at springs in limestone cliffs with Celtis, Dasyllirion, Acacia berlandieri & other species, Larrea, Buddleia, etc.", "on

flats near slopes of northeast-facing limestone cliffs with Celtis, Larrea, Acacia, Prosopis, Fouquieria, Hechtia, Agave, Bursera, Leucophyllum, etc.", "on sandy alluvial plains with Larrea, Acacia, Jatropha, Agave, Fouquieria, Opuntia, etc.", "on rocky slopes with Agave, Prosopis, Fouquieria, Acacia, Cassia, Mimosa, etc.", "on rocky limestone alluvial slopes with Larrea, Cordia, Agave, Fouquieria, Jatropha, Opuntia, etc.", "on steep south-facing slopes in reddish sandstone clay soil with Hechtia, Agave, Parthenium, Viguiera, etc.", and "on limestone outcroppings with Agave, Buddleia, Croton, Dasyllirion, Opuntia, etc." Stevens and his associates report it "common in desert scrub on calcareous ridges". Torke and his associates report finding it in areas of "thorn scrub with columnar cacti, steep slopes, and very rocky soils".

Recent collectors have found Lippia graveolens growing at altitudes of 60—2000 meters, flowering in February and from April to December, fruiting from May to December. The corollas are said to have been "white" on Breedlove 27656, Harmon & Dwyer 4199, Henrickson 5930, 5991, 6085, 6217, 6521, 7768, 13060, & 13399, Hinton 13061, Johnston, Tharp, & Turner 3509, McKee 11001, Messer 72/37, Molina R. 13202, 22727, 22829, & 23211, Rollins & Tryon 5888, Runyon 154, Rzedowski 22676, and Webster & al. 12909, "off-white" on Stevens, Donaghue, & Scott 2531, "creamy-white" on Correll & Correll 35330, "cream" or Herald & Clark 429, McVaugh 26479, and War-nock & Turner 8302, "creamy-white with yellow eye" on Lundell & Lundell 12340, "yellowish-white" on Webster & al. 11443, "pale yellowish-white with a dark-yellow center" on Davidse & Davidse 9304, "ochroleucous" on Johnston 8242, "yellowish" on Johnston & Muller 772 & 8801 and Rzedowski 12079 & 29861, and "yellow" on Moncayo 60, Stanford & al. 96, and Rzedowski 4533.

Common and vernacular names recently reported for the species are "akil-che [=vine-like tree] in Mayan, but in Mayan texts it is always listed by its Spanish name, 'orégano', "hierba dulce", "majorana de campo", "Mexican sage", "oreganillo", "oregano", "red brush", "red-brush", "red-bush", "salve blanco", "salvia", "scented lippia", "té de pais", "té del Paris", and "yerba dulce". According to Molina R. this is the "Mexican oregano" of Aruba. Stahl and his associates (1969) differentiate two common types of commercial "orégano" by gas chromatography and thin-layer chromatography — they found Greek orégano to have 7:1 concentration of carvacol to thymol, while Mexican orégano has a concentration of 1:1. Heath (1972) confirms the presence of carvacol and thymol. Lundell reports that L. graveolens is a medicinal herb in San Luis Potosí, while Messer reports the same from Oaxaca, where it is cooked to prepare a cure for stomach-ache. Grieve (1967) asserts that in Mexico its medicinal use is similar to that of Phylla scaberrima (A. L. Juss.) Moldenke.

Gibson (1970) asserts that Lippia graveolens inhabits "Rocky slopes or damp thickets on plains, 350 meters or less" in El Petén

and Zacapa, Guatemala, and gives its further distribution as "Southern Texas; Mexico; Nicaragua". She notes that "The aromatic leaves, either fresh or dried, are used in Central America for flavoring food, and the dry leaves are often sold in the markets".

Parks (1937) describes the species as "A slender-growing bush reaching a height of three feet or more. It is found only along the Rio Grande River [in Texas]", but will probably grow in other southern portions of the state. "Throughout the year it is covered with small green leaves and bears in early spring and again after rains small spikes of small lavender-colored flowers which make this plant a very desirable ornamental. The plant will do best as a low hedge or as a group of specimen plants. It has no thorns. It is easily transplanted because of a shallow root system. It should be used in roadside and park work throughout the sections [of Texas] where it will grow."

Uphof (1968) reports that in Mexico it is used in native medicine as a stimulant, emmenagogue, and demulcent, and, especially in Yucatán, as a tonic and expectorant. Martínez (1969), listing the plant as "Lippia Berlandieri Schauer", says "Existe de Coahuila a Tamaulipas, Veracruz, Oaxaca y Sinaloa. En Puebla se llama también salvia; en Guerrero, canelilla. Generalmente se usa como condimento especialmente para el pozole. La medicina popular lo usa como estimulante emenagogo y demulcente. En Teloloapan, Gro., usan el cocimiento 'contra el dolor de estómago' y la diarrea; la infusión alcohólica en fricciones 'contra ataques'". The illustration accompanying this discussion by Martínez, unfortunately, is of L. alba (Mill.) N. E. Br., so there is justifiable doubt as to which species his statements really apply.

Loesener (1912) cites Seler & Seler 1053 & 1092 from Nuevo León and 1391 from Oaxaca as "L. Berlandieri Schauer" and 3043 from Chiapas as "L. Berlandieri Schauer forma", commenting that "In Bezug auf Behaarung, Blattgrösse und Blattform, ferner auch in Bezug auf dichtere oder weitere Verteilung der Drüsen und auf die verschiedene Länge der Pedicelli und Grösse der Blüten scheint die Art doch recht veränderlich zu sein und in einigen Formen sich der L. graveolens H.B.K. so zu nähern, dass es fraglich ist, ob sie nicht bloß als eine Varietät dieser älteren Species aufrecht zu erhalten ist".

It may be noted here that the Webster, Miller, & Miller 12909 collection, cited below, has leaves that are very white-tomentose beneath even when mature and is thus anomalous; Mears & Mears 2631 is also not typical L. graveolens.

Rickett (1969) distinguishes L. alba from L. graveolens as follows: L. alba - "5 feet tall, with ovate, toothed leaves, and small purple, pink, or white flowers in heads"; L. graveolens - "up to 8 feet tall, with ovate or elliptic, scalloped leaves, and yellowish or white flowers in heads".

Pollen samples have been taken from Martínez & Trevino 30 and are deposited in the Palynological Reference Collection of the University of Texas herbarium.

It should also be noted here that the revised H.B.K. reference dates given above have been authenticated by Barnhart (1902). In Martínez's 1969 work the index lists this species for page "460", apparently in error.

Marroquin (1968) cites "Hernandez Corzo, Bouquet, & Barkley lhm (FcB. 1719 & 1720)" from Nuevo León, Mexico. González Quintero 2504 is a mixture of Lippia graveolens and Lantana velutina Mart. & Gal.

Material of Lippia graveolens has been misidentified and distributed in some herbaria as L. alba (Mill.) N. E. Br., L. nutans Robinson & Greenm., Lantana sp., Lantana involucrata L., and Salvia sp. On the other hand, the Bourgeau 2983, distributed as Lippia graveolens, actually is L. myriocephala var. hypoleia (Briq.) Moldenke, Debeaux 87 is L. origanoides H.B.K., Escalante 14 and Tharp 5904 are Lantana macropoda Torr., Taylor & Taylor 11692 is Lantana trifolia L., and H. Hernández s.n. [12/VII/1965] is Lantana velutina Mart. & Gal.

Additional citations: TEXAS: Brewster Co.: Blassingame, Rowell, & Stanford 1811 (Lk); Correll & Correll 35330 (Ld); Warnock & Turner 8302 [2500] (Au—121187). Cameron Co.: Fleetwood 8114 (Au—243034). Hidalgo Co.: W. F. Blair 48-420 (Au—121176); L. I. Davis s.n. [Oct. 21, 1945] (Au—171997); Lundell & Lundell 9807 (Ld), 9906 (Ld); Tharp & York 51-252 (Au—121180, B1—87441). Jim Hogg Co.: Tharp s.n. [9 Oct. 1958] (Au—164542, Ln—166040). Starr Co.: Gongora, Anda, & McCart 8471 in part (Au—236374, Ld, Lk); R. Runyon 154 (Au—269656); Tharp & Johnston 541907 (Au—121188). Val Verde Co.: Flyer 821 (Au—280778), 858 (Au—280767); L. Johnston 10 (Au—167587); Mears & Mears 2631 (Au—297560, Au—297561); Rowell & Blassingame 15616 (Sl); Seigler & Payne 1959 (Au—285714). Webb Co.: Gongora, Anda, & McCart 8471 in part (Tu—156485); Johnston, Tharp, & Turner 3509 (Au—121189); Martínez & Trevino 30 (Au—222228). Zapata Co.: Cory 35926 (Au—121177); M. de J. Solis 13 (Au—233344). MEXICO: Chiapas: Breedlove 27656 (N); Breedlove & Raven 13177 (Ld); F. Miranda 5062 (W—2508293); Webster, Miller, & Miller 12909 (E—1982093, Ld, M1). Chihuahua: Henrickson 5930 (Ld), 7768 (Ld); Johnston & Muller 1171 (M1); R. M. Stewart 880 (Au—299573). Coahuila: E. T. Arnold 95 (Te—67975); Chiang, Wendt, & Johnston 8273a (Ld); Cole, Minckley, & Pinkava 3600 (Te—66744), 3912 (Te—66743), 4252 (Te—66747); Henrickson 5991 (Ld), 6035 (Ld), 6085 (Ld), 6217 (Ld), 7840 (Ld), 11840b (Ld), 12182 (Ld), 13060 (Ld); I. M. Johnston 8242 (Au—300032), 8801 (Au—301590); Johnston & Muller 772 (Au—302091, M1), 836 (Au—302160, M1), 1171 (Au—300591); Lehto, Keil, & Pinkava 5202 (Te—66746), 5657 (Te—66745), 5673 (Ld, N, Te—66742); E. Marsh 418 (Au—212275); Edw.

Palmer 1025 (Ms--30909), 1026 (Ms--30911); Stanford, Retherford, & Northcraft 96 (Tu--120211); Tuttle 471 (Tu--187699). Durango: Henrickson 12381 (Ld). Guerrero: Halbinger s.n. [4.XI.1967] (Ip); Herald & Clark 429 (Ca--1285638); Lord & McComas 621 (Ca--1285616, Ip); J. Rzedowski 22676 (Ip, Ld, Mi, Ws), 29861 (Mi, Sd--89699, W--2703595). Hidalgo: Gilly & Camp 20 (Ln--199027, N); González Quintero 2504 in part (Ip), 2665 (Ip, Mi), 2745 (Ip, Ld, Mi), 2902 (Ip), 3037 (Ip, Mi), 3585 (Ip, Mi); Lundell & Lundell 12340 (Au--280307); Moncayo 42 (Ip); J. Rzedowski 12079 (Ip). Jalisco: J. Rzedowski 17557 (Au--243591). Michoacán: Hinton 13061 (Se--106354, Tu--112023). Nuevo León: Castano 19 (Au--232670); O. M. Clark 6641 (E--1287872); Kruckeberg 4807 (Se--217605); C. L. Lundell 5697 (Tu--119010); Pringle 1934 (Ms--30910, Mu--3876, Mu--3877); Rollins & Tryon 5810 (Au--300214), 5888 (Au--300188); Roybal 1093 (W--2631135); R. F. Smith M.638 (Au--209676). Oaxaca: Andrieux 166 (Mu--14); Cruz Cisneros 2571 (Au--303687, Mi); Kenoyer 1511 (Au--121162); Liebmann 11249 (Ba); MacDougall s.n. [Nov. 7, 1970] (Ld, N); McKee 11001 (W--2641422); Messer 72/37 (Mi), 165 (Mi); Pringle 6258 (Ms--30867, Mu--1818); Rowell, Webster, & Barkley 17M490 (Au--170142); Stevens, Donoghue, & Scott 2531 (Ld); Torke, Dunn, & LeDoux 410 (Ld, N); Wallace, Dunn, & LeDoux 463 (N). Puebla: Davidse & Davidse 9304 (Ld); Dunn & Dunn 18750 (N, W--2705512); Hernández M. & Cedillo T. 701 (Mi); Moncayo 60 (Ip); J. Rzedowski 20480 (Ip); Webster, Miller, & Miller 11443 (Au--262653). Querétaro: R. McVaugh 26479 (Mi). San Luis Potosí: Henrickson 6521 (Ld); C. L. Lundell 5427 (Tu--119011); J. Rzedowski 4533 (Ip), 6479 (Ip), 6686 (Ba). Sinaloa: H. S. Gentry 14286 (Ld), 14426 (Ld); K. Reiche 386 (Mu). Tamaulipas: Dunn, Harmon, & Walker 17590 (N); Stanford, Lauber, & Taylor 2226 (Se--149146). Zacatecas: Henrickson 6379 (Ld), 13399 (Ld); Lloyd 97 (E--206151); Taylor & Taylor 6086 (N). State undetermined: Gregg s.n. [N. Cap.] (E--116655), s.n. [Majorana de campo] (E--116654). GUATEMALA: Baja Verapaz: Harmon & Dwyer 4199 (W--2705462). HONDURAS: Choluteca: Molina R. 23211 (Ws). Comayagua: Molina R. & Molina 22727 (N). El Paraíso: Molina R. 13202 (W--2735742). Morazán: Molina R. & Molina 22829 (N).

LIPPIA GRISEA Moldenke, Phytologia 20: 242. 1970.

Synonymy: Liorea grisea Anon., Biol. Abstr. 52 (2): B.A.S.I.C. S.135, sphalm. 1971.

Bibliography: Moldenke, Phytologia 20: 242. 1970; Anon., Biol. Abstr. 52 (2): B.A.S.I.C. S.135. 1971; Moldenke, Biol. Abstr. 52: 714. 1971; Moldenke, Excerpt. Bot. A.18: 445. 1971; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 891. 1971; Heslop-Harrison, Ind. Kew. Suppl. 15: 80. 1974.

Citations: BRAZIL: Distrito Federal: Irwin & Soderstrom 5595 (N—isotype, W—2709910—isotype, Z—type).

LIPPIA GRISEBACHIANA Moldenke

Additional bibliography: Hieron., Bol. Acad. Mac. Cienc. Córdoba 4: [Sert. Sanjuan.] 405—406. 1881; Briq. in Chod. & Wilczek, Bull. Herb. Boiss., ser. 2, 2: 544. 1902; Troncoso in Böcher, Hjerting, & Rahn, Dansk Bot. Arkiv 22: 108. 1963; Moldenke, Phytologia 13: 355. 1966; Hocking, Excerpt. Bot. A.11: 103. 1967; Moldenke, Fifth Summ. 1: 198 (1971) and 2: 551, 558, 559, & 891. 1971; Altschul, Drugs & Foods 244. 1973; Troncoso, Darwiniana 18: 338 & 410. 1974.

Recent collectors have found this plant growing at 1000—1200 meters altitude, flowering in March and December. The corollas are said to have been "rose" on Meyer & Vaca 23619, "lilac" on Cabrera, Solbrig, Torres, & Vuillemier 16811, and "white" on Cabrera & Fabris 13247.

Altschul (1973) reports that this species is used to "purify" blood in Argentina, citing Jørgensen 1025. Briquet (1902) cites Wilczek 46. Troncoso (1974) records it from Catamarca, La Rioja, and Salta.

Material has been misidentified and distributed in some herbaria as L. turbinata Griseb. and as Lantana sp.

Additional citations: ARGENTINA: Catamarca: Risso 687 (N); Rodriguez Vaquero 351 (Ut—3305388). Jujuy: Cabrera & Fabris 13247 (N); Cabrera, Solbrig, Torres, & Vuillemier 16811 (S). Salta: Dillon & Rodriguez 540 (Ld). Tucumán: Krapovickas 3240 (E—1305734); Lillo 5321 [Herb. Inst. Lillo 32385] (E—1208840); Meyer & Vaca 23619 (Ld); Villa 661 (Ms—34160).

LIPPIA HARLEYI Moldenke, Phytologia 31: 231. 1975.

Bibliography: Moldenke, Phytologia 31: 231 & 384. 1975.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 16788 (Z—type).

LIPPIA HASSLERIANA Chod.

Additional & emended bibliography: Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 304 & 1153. 1904; Briq. in Chod. & Hassl., Pl. Hassler. 2: 489. 1904; Moldenke, Phytologia 13: 355. 1966; Moldenke, Fifth Summ. 1: 156 & 186 (1971) and 2: 556, 773, & 891. 1971; Troncoso, Darwiniana 18: 334, 337, & 410. 1974.

Pedersen encountered this plant on rough grasslands. The corollas are said to have been "white" on Pedersen 9520. Troncoso (1974) cites this same collection from the San Isidro herbarium.

Additional citations: PARAGUAY: Pedersen 9520 (N).

LIPPIA HATSCHBACHII Moldenke, Phytologia 27: 65—66. 1973.

Synonymy: Lippia hatschbachii Moldenke, Biol. Abstr. 57: 3780. 1974.

Bibliography: Moldenke, Phytologia 27: 65—66 (1973) and 28:

439. 1974; Moldenke, Biol. Abstr. 57: 3780. 1974; Moldenke, Phytologia 36: 44. 1977.

Citations: BRAZIL: Mato Grosso: Hatschbach 31953 (N—isotype, W—2744570—isotype, Z—type).

LIPPIA HEDERAEFOLIA Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 407. 1967; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 556 & 891. 1971; Troncoso, Darwiniana 18: 339 & 410. 1974.

Recent collectors describe this plant as shrubby from a perennial base or as a slender, simple, brittle subshrub 0.5—1.5 m. tall, and have found it growing in rocky cerrado and sparse woods, cerrado and burned-over cerrado, caatinga, and on campo slopes, at 800—1200 meters altitude, flowering from February to April and in July. Anderson reports it from a "steep hillside cerrado with pebbly clay soil", while Irwin and his associates encountered it "in cerrado on gravelly slopes", "in cerrado in area of cerrado and campo", "occasional but mostly sterile", and "common but few in flower at this time [March] in cerrado and campo on middle slopes". The corollas are said to have been "bright-magenta" on Irwin & al. 27267, "rose-pink" on Irwin & al. 28442, "pinkish-purple" on Anderson 8832, "bright-rose" on Hill 1068, "lavender-pink" on Anderson 8778, and "red" on Lützelburg 4050. The vernacular name, "camará", is recorded for it by Lützelburg.

Additional citations: BRAZIL: Bahia: Lützelburg 4050 (Mu). Minas Gerais: W. R. Anderson 8778 (N), 8832 (Ld, N); S. R. Hill 1068 (Hl); Irwin, Fonsêca, Reis dos Santos, & Ramos 27267 (Ac), 28442 (Ld); Irwin, Reis dos Santos, Souza, & Fonsêca 23089 (N), 23904 (N); Martius s.n. [in campis deserti Serro Frio Julio 1818] (Mu—46—cotype, Z—cotype). MOUNTED ILLUSTRATIONS: Mart., Fl. Bras. 9: pl. 41. 1851 (N, Z).

LIPPIA HERBACEA Mart.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 12: 201—202. 1965; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 891. 1971; Troncoso, Darwiniana 18: 338 & 410. 1974.

Recent collectors describe this plant as a few-branched shrub, 1.7 m. tall, and have found it growing in brejo (sedge meadow), flowering in January and July. The corollas are said to have been "lilac" on both Hatschbach collections cited below.

Additional citations: BRAZIL: Goiás: Hatschbach 34750 (Z). Minas Gerais: Hatschbach & Ramamoorthy 38008 (Ld); Martius 1705 [Macbride photos 20328] (Mu—47—cotype, Mu—48—cotype, Mu—49—cotype, Z—cotype).

LIPPIA HIERACIFOLIA Cham.

Additional synonymy: Lippia hieraciifolia Martinez-Crovetto, Bonplandia 2: 53, spalm. 1965.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Martinez-Crovetto, Bonplandia 2: 35, 52, & 53. 1965; Moldenke, Phytologia 13: 356. 1966; Moldenke, Résumé Suppl. 16: 23. 1968; Reitz, Sellowia 22: 81. 1970; Moldenke, Fifth Summ. 1: 156, 189, & 198 (1971) and 2: 549, 550, 556, & 891. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

Recent collectors refer to this plant as "erect" and have found it growing on high campo near habitations and "en pastizal con Butia paraguayensis", flowering in January, March, and September. The corollas are said to have been "yellow" on all the collections cited below. Troncoso (1974) reports it only from Corrientes and Misiones, Argentina, and "Brasil meridional".

Additional citations: BRAZIL: Rio Grande do Sul: O. Camargo 82 [Herb. Anchieta 58638] (B); Rambo 46715 (B), 53033 (B); Reineck & Czermak 66 [Macbride photos 20320] (Mu--3794). ARGENTINA: Corrientes: Krapovickas & Cristóbal 16071 (Ld). Misiones: Krapovickas, Cristóbal, Maruffak, Pire, & Tressens 15332 (Z); Krapovickas & Cristóbal 28706 (Ld).

LIPPIA HIRSUTA L. f.

Additional synonymy: Lippia hirsuta Espinal, Vision Ecolog. Dept. Valle 41, sphalm. 1965. Lippia tomentosa L. f. ex López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 59, in syn. 1975 [not L. tomentosa Sessé & Moc., 1940].

Additional bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 956 (1789) and imp. 2, 2: 956. 1796; H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 217 (1817) and ed. quarto, 2: 268. 1818; Pers., Sp. Pl. 3: 352. 1819; Schau., Linnaea 20: 479. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Pittier, Man. Pl. Usual. Venez. 111 & 435. 1926; J. A. Clark, Card-Ind. Gen. Sp. & Var. Pl., issue 245. 1965; Espinal T., Vision Ecolog. Dept. Valle 41 & 44. 1965; Hocking, Excerpt. Bot. A.9: 367. 1965; Schubert, Assoc. Trop. Biol. Bull. 4: 73. 1975; Hocking, Excerpt. Bot. A.11: 103. 1967; Moldenke, Phytologia 14: 407. 1967; Espinal T., Vision Ecolog. Dept. Valle Cauca 29, 34, 41, & 44. 1968; H. Weber in Fittkau, Illies, Klinge, Schwabe, & Sioli, Biogeogr. & Ecol. S. Am. 2: [Van Oye, Monog. Biol. 19:] 491. 1968; Moldenke, Fifth Summ. 1: 117 & 124 (1971) and 2: 549, 556, 566, & 891. 1971; Moldenke, Phytologia 23: 417 (1972) and 28: 435, 436, 459, & 460. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21 (1974) and 15: 57-61, [fig. 12]. 1975; Moldenke, Phytologia 31: 381, 382, 396, 402, & 403. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 17: 48. 1976; Moldenke, Phytologia 36: 32. 1977.

Recent collectors refer to this species as a tree, 6-7 m. tall, or a shrub, 2 m. tall, and have encountered it at altitudes of 1900-2100 meters, flowering in January and March. The corollas are said to have been "white" on García-Barriga 11011. It is said to be among the common trees in the dry zone of Valle del Cauca, Colombia, and is called "gallinazo" and "salvio blanco".

López-Palacios (1975), after considerable field study, writes "A la conclusión que he llegado es que en Venezuela no hay evidencia de que exista la L. hirsuta, y por tanto se excluyo de la flora." While he feels that "oblong leaves" characterize typical L. hirsuta, rather than larger heads of flowers and fruits, from var. moritzii, I still feel that the larger-sized heads constitute the more reliable character. A few intermediate specimens occur in herbaria which may perhaps represent a natural hybrid.

It should be noted that the H.B.K. emended reference dates cited above were authenticated by Barnhart (1902). The L. tomentosa Sessé & Moc., referred to above, is a synonym of L. graveolens H.B.K.

The Bernardi 3135 previously cited as L. hirsuta, as well as Ruiz-Terán & López-Palacios 7394 & 10170, appear to be better regarded as var. moritzii (Turcz.) López-Palacios, while Garganta 702 and Hodge 6528 are L. schlimii var. glabrescens (Moldenke) Moldenke.

Additional & emended citations: COLOMBIA: Boyacá: Cuatrecasas 1863 (W--1773188). Caldas: Sneider 3089 (Ld). Cundinamarca: García-Barriga 11011 (W--1852208); López-Palacios & Jaramillo M. 3669 (N, Z).

LIPPIA HIRSUTA var. **MORITZII** (Turcz.) López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 14: 21. 1974.

Synonymy: Dipterocalyx scaberrima Schlecht., *Linnaea* 26: 647. 1853 [not Lippia scaberrima Sond., 1850]. Lippia moritzii Turcz., *Bull. Soc. Nat. Mosc.* 36 (2): 204. 1863. Lippia floribunda Briq., *Ann. Conserv. & Jard. Bot. Genève* 4: 237. 1900 [not L. floribunda Hort., 1959, nor H.B.K., 1817, nor Humb. & Bonpl., 1841, nor Humb. & Kunth, 1843, nor Kunth, 1825, nor R. A. Phil., 1891]. Lippia briquetii Moldenke, *Torreyia* 34: 9. 1934. Lippia venezuelensis Moldenke ex Pittier, *Supl. Pl. Usual. Venez.* 62 & 119, in syn. 1939. Lippia schlechtendalii Moldenke, *Phytologia* 2: 53. 1941. Lippia briquetii Moldenke, *Fifth Summ.* 2: 551, in syn. 1971. Lippia hirsuta var. moritziana (Turcz.) López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 15: 61. 1975.

Bibliography: H.B.K., *Nov. Gen. & Sp. Pl.*, ed. quarto, 2: 267. 1818; Sond., *Linnaea* 23: 87. 1850; Schlecht., *Linnaea* 26: 647. 1853; Turcz., *Bull. Soc. Nat. Mosc.* 36 (2): 204. 1863; R. A. Phil., *Anal. Mus. Nac. Chile Bot.* 1: 59. 1891; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 2: 95. 1894; Briq., *Ann. Conserv. & Jard. Bot. Genève* 4: 237. 1900; K. Schum. in *Just, Bot. Jahresber.* 28 (1): 497. 1902; Thiselet.-Dyer, *Ind. Kew. Suppl.* 2: 106. 1904; Pittier, *Man. Pl. Usual. Venez.* 111 & 435. 1926; Moldenke, *Torreyia* 34: 9. 1934; A. W. Hill, *Ind. Kew. Suppl.* 9: 161. 1938; Moldenke, *Alph. List Common Names* 2. 1939; Pittier, *Supl. Pl. Usual. Venez.* 55, 62, & 119. 1939; Moldenke, *Phytologia* 2: 53. 1941; Moldenke, *Alph. List Inv. Names* 23. 1942; Moldenke, *Known Geogr. Distrib. Ver-*

benac., [ed. 1], 32, 95, & 96. 1942; Moldenke, *Phytologia* 2: 107. 1945; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 2: 95. 1946; Moldenke, *Alph. List Cit.* 1: 7 & 22. 1946; Moldenke, *Alph. List Inv. Names Suppl.* 1: 16. 1947; H. N. & A. L. Moldenke, *Pl. Life* 2: 51, 73, & 81. 1948; Moldenke, *Alph. List Cit.* 2: 352, 580, & 634 (1948), 3: 820 & 974 (1949), and 4: 1075, 1079, & 1132. 1949; Moldenke, *Known Geogr. Distrib. Verbenac.*, [ed. 2], 60, 63, & 189—191. 1949; H. N. & A. L. Moldenke, *Anal. Inst. Biol. Mex.* 20: 9. 1949; E. J. Salisb., *Ind. Kew. Suppl.* 11: 138. 1953; Moldenke, *Résumé* 67, 71, 278, 318, 461, & 462. 1959; Moldenke, *Résumé Suppl.* 1: 5, 19, & 25 (1959) and 2: 4 & 9. 1960; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 2: 95. 1960; Moldenke, *Résumé Suppl.* 12: 3. 1965; Moldenke, *Phytologia* 12: 79, 111, 207, 208, & 291—292 (1965), 12: 481—482 & 484—486 (1966), and 13: 361—362. 1966; Overwinkler, *Pterid. & Sperm. Venez.* 31 & 78. 1970; Moldenke, *Fifth Summ.* 1: 117 & 124 (1971) and 2: 551, 554, 560, 568, & 893. 1971; Moldenke, *Phytologia* 25: 228. 1973; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 14: 21 (1974) and 15: 58—63, [fig. 12]. 1975; Moldenke, *Phytologia* 31: 381, 382, 396, 402, & 403. 1975; López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 17: 48. 1976; Moldenke, *Phytologia* 36: 32. 1977.

Illustrations: López-Palacios, *Revist. Fac. Farm. Univ. Los Andes* 15: 58, [fig. 12]. 1975.

Recent collectors describe this much-misunderstood plant as a shrub, treelet, or small tree, 3—15 m. tall, erect, unarmed, the crown globose, the trunk straight, cylindric, 30 cm. in diameter at breast height, the "coteza escomosa de color claro", the leaves variable, oblong, oval, or oval-lanceolate to subelliptic or elliptic, bicolored, "envés mas claro, haz manchado de blanco" or pale- to medium-green above, paler beneath, scabrid above, velutinous beneath, papery, dull, evergreen, aromatic, the flower-heads medium-sized for the genus, 6 x 4 mm., greenish-white, in ample panicles, the flowers small, aromatic, attracting many insects. They have found it growing on rocky slopes, in meadows and forests, cloud-forests on steep mountain slopes, and rocky soil near streams, at 800—2300 m. altitude, flowering from August to February and in May and June, fruiting in February, March, June, August, September, and November. Vernacular names reported for it are "amogre", "humo", and "mogre". Benítez de Rojas describes the plant as "leñosa, nervadura al en envés resaltantes, 4 pétalos blancos".

The corollas are also said to have been "white" on Breteler 4134, López-Figueiros & Rodríguez 9081, Pittier 9966, Ruiz-Terán & López-Palacios 1898, 7394, & 10170, and Steyermark 91592 and "cream" on Aristeguieta 3350 and Breteler 3135 & 3398.

The L. floribunda credited to H.B.K., to Humb. & Bonpl., to Humb. & Kunth, and to Kunth by various authors, referred to in the synonymy above, is a synonym of L. schlimii var. glabrescens (Moldenke) Moldenke [not of L. americana L. as previously thought], that of R. A. Philippi is Aloysia reichii Moldenke, and that cred-

ited to "Hort." is Lantana achyranthifolia Desf.

My good friend, Santiago López-Palacios, in a letter to me dated February 27, 1975, says concerning the differences between typical L. hirsuta and its var. moritzii: "No he podido encontrar ninguna diferencia notable entre las dos que justifique una separación específica: el porte de la planta, el indumento y sus características florales son las mismas, sin que tenga valor el carácter de la cabezuelas, pues éstas varían en tamaño según la edad de los árboles, las zonas de crecimiento de los mismos y el estado de madurez de la cabezuelas. Le he conservado rango infraespecífico sólo por la forma de las hojas, que en L. hirsuta, en su forma típica, son oblongo y en la variedad ovadas. La ésta la única diferencia, a pesar de todo no muy firme, pues se encuentran ciertas formas intermedias, prácticamente imposibles de diferenciar, como lo digo en Rev. Fac. de Farm. 14: 58. La diferencia quedaría así:

Hojas oblongas.....Lippia hirsuta

Hojas ovadas.....Lippia hirsuta var. moritzii".

While López-Palacios regards the "ovate leaves", rather than the smaller-sized heads even in full anthesis and/or fruit, as characterizing this variety and distinguishing it from the typical form of the species, I feel that the smaller-sized flowering and fruiting heads constitute a more reliable character, at least in herbarium material.

Regarding L. schlechtendalii López-Palacios says: "Le publicación primitiva de Linnaea 26: 647, comienza así: 'Fruticulus 8-10', corolis albis, in locis siccis ad Chacafto, alt. c. 4000'. Novb. (426) -- Dipterocalycis genus olim a Chamissone constitutum, a beato Schauero cum Lippia conjunctum, a nostra sententia restituendum', y luego sigue la descripción. El Dr. Moldenke.... 'Nada conozco de esta planta, excepto lo que de ella se da en la descripción original'.

"No incluyo este taxon en la Flora, porque nunca he visto el ejemplar 426 de Wagerer, en que se funda, posiblemente destruido en B.

"He estado en Chacafto y en todo el Dto. Federal no aparece Lippia alguna que concuerde con la descripción de von Schlechtendal, a no ser la L. moritzii. Tengo el convencimiento de que son coespecífica y de que se trata de una sola y misma cosa.

"No fortuna el ejemplar de Wagerer no ha aparecido; y oja lá no aparezca, pues si ello ocurre y se confirman mis presunciones, la L. moritzii Turcz. pasaría definitivamente a sinonimia para dar lugar a la L. schlechtendalii, ya que la descripción de ésta antecede en 10 años a la de Turczaninow."

Turczaninow's original description (1863) is far superior to that of Schlechtendal: "Lippia (Zapania) Moritzii. L. caule fruticoso tetragono, apice cum petiolis atque inflorescentia dense pubescentibus; foliis petiolatis ovato-lanceolatis, acuminatis, basi minus angustatis, fere a basi serratis scabris, supra bulla-

to-rugosis, subtus reticulatis; paniculis axillaribus pedunculatis et terminali sessili magis composita trichotomis, ramis ultimis racemosis; capitulis ovatis; bracteis ovatis acutiusculis tubum corollae superantibus; laciniis calycinis margine nec dorso ciliatis. Capitula parva, magnitudine illorum L. pauciserratae. Venezuela, prope coloniam Tovar, Moritz No 1640, sub L. callicarpaefolia dubitanter determinata."

Material of this variety has been misidentified and distributed in some herbaria as L. callicarpaefolia H.B.K., L. hirsuta L. f., and Labiatae. On the other hand, the Cuatrecasas 1863 and Fosberg 22193, previously cited as this variety, actually represent typical L. hirsuta. The Bernardi 3135, cited below, was previously (1966) erroneously cited as typical L. hirsuta.

Additional & emended citations: COLOMBIA: Caldas: Sneidern 3016 (S), 3089 (S). Cundinamarca: Köpie 4524 (Cp, Ld); Triana 2049 (Br). Magdalena: Seifritz 397 (W--1572471). Norte de Santander: López-Palacios 3578 (N, Z). VENEZUELA: Aragua: Allart 288 in part (Ve--12773), 288a (W--1231237); Fendler 863 (Br, E--1948650, F--photo, N, N--photo, Si--photo, Z--photo); Lasser & Foldats 4276 (Ve); Moritz 1640 (Z--photo of type); Pittier 9966 (N, W--1186992); Ruiz-Terán & López-Palacios 10170 (Ac); J. A. Steyermark 91592 (Ve, W--2583946); Vogl s.n. [Maracay] (Mu). Distrito Federal: Allart 85 (N, Ve--12777, W--1199018), 167 (N, Ve, W--1231158); Badillo 694 (Ve--12770); Bailey & Bailey 994 (Ba, W--1198400); Davidse & Morillo 4015 (Ld, N); Delgado 54 (Ve--12771, W--1692661), 507 (Ve); Eggers 13580 (Lu, S, W--939323, W--1234732); Lasser 1008 (W--1878281), s.n. [Steyermark 55099] (F--1205145); Pittier 9869 (W--1186477), 9870 (N, W--1186478), 9966 (N), 12251 (Kr), 13779 (Ve--12772, W--1740474); Ll. Williams 10625 (Ve--12769), 12251 (Ca--734500, W--1778908); Williams & Alston 18 [Ll. Williams 10625] (Ve--12768). Lara: Benítez de Rojas 1741 (Ut--3286348). Mérida: Bernardi 3135 (N), 3735 (Ve), 6399 (N), s.n. [10 Mayo 1956] (N); Breteler 3398 (S); Gines 1587 (W--2048533); López Figueiras & Rodríguez 9081 (W--3739882); López-Palacios 3160 (Ld, N); López-Palacios & Bautista 3380 (Ac, Ld); Oberwinkler & Oberwinkler 12449 (Mu); Ruiz-Terán & López Figueiras 1898 (N), 1922 (N). Miranda: Allart 288 in part (N). Táchira: Henri 1 (W--2383065). Trujillo: Aristeguieta 3350 (N); Breteler 4134 (N); Jahn 1140 (Ve, W--1186740); Ruiz-Terán & López Figueiras 2213 (N); Ruiz-Terán & López-Palacios 7394 (Ld).

LIPPIA HIRTA (Cham.) Meisn.

Additional & emended synonymy: Lippia hirta "(Cham.) Meisn. ex C. Dietr." apud Hocking, Excerpt. Bot. A.11: 103. 1966. Lippia hirta Spreng. ex Moldenke, Résumé Suppl. 18: 13, in syn. 1969.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266.

1858; Angely, Fl. Anal. Paran., ed. 1, 575. 1965; Hocking, Excerpt. Bot. A.11: 103. 1967; Moldenke, Phytologia 14: 407. 1967; Moldenke, Fifth Summ. 1: 156 & 476 (1971) and 2: 555, 557, & 892. 1971; Troncoso, Darwiniana 18: 334, 337, & 410. 1974.

Recent collectors describe this plant as erect, 0.7—1 m. tall, with a xylopodium, and have encountered it on campos, dry or grassy campos, and "campo limpo", flowering from December to March, fruiting in December and January. The corollas are said to have been "purple" on Hatschbach 23312 & 31739, "lilac" on Hatschbach 13511 & 23246, "deep-lilac" on Hatschbach & Koozicki 18442, "red" or "rose" on Pereira 8324, "violet" on Hatschbach 8679 & 28563, and "wine-color" on Hatschbach 36797 & 37915.

Troncoso (1974) cites Smith & Klein 10672 from Santa Catarina, Brazil, in the San Isidro herbarium.

Additional citations: BRAZIL: Paraná: Dusén 16263 (Mu), s.n. [12.3.1904] (Mu—4240); Hatschbach 8679 (Mu), 13511 (W—2563853), 23246 (Mi), 25971 (Ld), 28563 (Ld), 31739 (N), 37915 (Ld); Hatschbach & Koozicki 18442 (Ft, N, W—2536559); Hatschbach & Pedersen 36797 (Ld); Hatschbach, Smith, & Klein 12139 (Ac); Krapovickas, Cristóbal, & Maruffak 23089 (Ld), 23312 (Ld); E. Pereira 8324 [Pabst "7599" & 7699; Herb. Brad. 30657] (Mu, N); Reitz & Klein 17411 (N, W—2548340).

LIPPIA HISPIDA Good.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 58 (2): 329. 1938; Moldenke, Phytologia 12: 212. 1965; Moldenke, Fifth Summ. 1: 244 (1971) and 2: 892. 1971; Moldenke, Phytologia 28: 442. 1974.

Pritchard describes this plant as a small shrub, 4—6 feet tall, with lemon-yellow flowers, and found it growing on riverbanks, at 1875 meters altitude, flowering in July.

The type specimen of this species is deposited in the herbarium of the British Museum (Natural History) in London.

Additional citations: ANGOLA: Huila: Pritchard 306 (E—1674076, Z). Province undetermined: Gosseweiler 2362 [Mo. Bot. Gard. photo A.833] (Gz—photo of type, N—photo of type).

LIPPIA HOEHNEI Moldenke

Additional & emended bibliography: F. C. Hoehne, Resen. Hist. Secc. Bot. Agron. Inst. S. Paulo 153 & 161. 1937; Moldenke, Phytologia 1: 467—468 (1940) and 12: 212—213. 1965; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 892. 1971; Moldenke, Phytologia 31: 384. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

This binomial was first published effectively by Hoehne (1937) as a hyponym -- the type is cited, but without description -- in April, 1937, validated later by me in 1940. Recent collectors describe the plant as an erect subshrub or shrub, 1—1.7 m. tall, "não ramosa", the bracts lilac in color, and have found it growing along roadsides, in cerrado, and on "campo limpo", at alti-

tudes of 550—770 meters, flowering in February, June, August, and September, in fruit in February and August. Irwin and his associates report it "frequent" in cerrado, while Maguire and his associates refer to it as "frequent" after fires. The corollas are said to have been "rose" color on Hatschbach 34066 & 34691, "rosy-white" on Maguire & al. 56837, "red-violet" on Irwin & al. 16489, and "lavender-pink" on Maguire & al. 56319.

Additional citations: BRAZIL: Mato Grosso: Goodland 511 (N); Hatschbach 34066 (Z), 34601 (Ld); Irwin, Grear, Souza, & Reis dos Santos 16489 (Ld, W—2795964); Maguire, Murça Pires, Maguire, & Silva 56319 (N), 56837 (N, N).

LIPPIA HOEHNEI var. GOYAZENSIS Moldenke, Phytologia 30: 349. 1975.

Bibliography: Moldenke, Phytologia 30: 349 (1975) and 31: 384. 1975; Hocking, Excerpt. Bot. A.28: 257. 1976.

Citations: BRAZIL: Goiás: Hatschbach 34642 (Z—type).

LIPPIA INDICA Moldenke

Additional bibliography: Sebastine, Bull. Bot. Surv. India 4: 223. 1962; Moldenke, Phytologia 12: 216—217. 1965; Elasco, Inst. Franç. Pond. Trav. Sec. Scient. Tech. 10: 384. 1971; Moldenke, Fifth Summ. 1: 277 (1971) and 2: 892. 1971; Moldenke, Phytologia 34: 275 (1976) and 38: 392. 1978.

Material of this species has been misidentified and distributed in some herbaria as Lantana albiflora Wight.

Additional citations: INDIA: Coimbatore: Wight 2295bis (Mu—1341, Z).

LIPPIA INOPINATA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 408. 1967; G. Taylor, Ind. Kew. Suppl. 14: 79. 1970; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 892. 1971.

Recent collectors describe this plant as a slender shrub, 3 meters tall, "with a dense bloom of yellowish-white flowers", and have found it growing in dry lowland forest, in "xeric matorral of Opuntia, Bursera, and Ipomoea arborescens [intrapilosa]", and on "ladera riolítica con vegetación de matorral de Opuntia y Prosopis", at altitudes of 130—2045 m., flowering in February, October, and November. The corollas are said to have been "yellow" on Rzedowski 25093.

Additional citations: MEXICO: Aguascalientes: Detling 8739 (Ip, W—2669357); J. Rzedowski 25093 (Mi, Z). Jalisco: Gentry & Gentry 23542 (W—2820869). Puebla: R. McVaugh 22493 (Ip).

LIPPIA INSIGNIS Moldenke, Phytologia 32: 483 & 485. 1976.

Bibliography: Moldenke, Phytologia 32: 483 & 485 (1976) and 34: 258. 1976; Hocking, Excerpt. Bot. A.28: 259. 1976.

Citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 17009 (K—type, Z—photo of type).

LIPPIA INTEGRIFOLIA (Griseb.) Hieron.

Additional & emended bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 406. 1881; Fester & Martinuzzi, Rev. Fac. Quim. Ind. & Agr. Univ. Nac. Litoral. Santa Fé Arg. 19: 54--74. 1950; Anon., Chem. Abstr. 45: 7306--7307 (1951) and 46: 11586--11587. 1952; Fester & Martinuzzi, Anal. Asoc. Quim. Arg. 40: 36--60. 1952; Canosa, Rev. Asoc. Bioquim. Arg. 18: 225--230. 1953; Anon., Chem. Abstr. 48: 3638. 1954; Karrer, Konstit. & Vork. Organ. Pflanzenst. 32. 1958; Moldenke, Phytologia 14: 408. 1967; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 265. 1969; Moldenke, Fifth Summ. 1: 198 (1971) and 2: 557, 567, & 892. 1971; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 668. 1973; Moldenke, Phytologia 28: 441. 1974; Troncoso, Darwiniana 18: 338 & 410. 1974.

Recent collectors refer to this plant as herbaceous or as a shrub, 1 m. tall, and have found it growing at 2800 meters altitude, flowering from February to April, fruiting in February and April. The corollas are said to have been "white" on Garcia 906 and on Krapovickas & al. 21924. Troncoso reports it from La Rioja, Salta, San Juan, San Luis, and Tucumán, Argentina.

Karrer (1958) reports the presence of dipentene, $C_{10}H_{16}$, in this plant and in such unrelated species as Baeckea crenulata, Libocedrus bidwellii, Litsea zeylanica, Phyllocladus trichomanoides, Picea mariana, Pittosporum tenuifolia, etc. Fester & Martinuzzi (1951, 1952) report the presence of a volatile oil, 1-limonene, dipentene, 1-camphor, a sesquiterpene, and a compound (ester or lectone) in volatile oil in the leaves, where Canosa (1953) found eucalyptol, dipentene, and camphor in volatile oil.

Material of L. integrifolia has been misidentified and distributed in some herbaria as L. turbinata Griseb.

Additional citations: ARGENTINA: Catamarca: Reales 1030 (N), 1281 (N), 1315 (N). La Rioja: Cabrera, Solbrig, Torres, & Vuillemier 16700 (Au--262484). Mendoza: Ruiz Leal 15452 (Tu--162098). Salta: Krapovickas, Maruffak, Oliva, & Pueyo 21924 (Ld). Santiago del Estero: P. Garcia 906 (N).

LIPPIA INTERMEDIA Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Angely, Fl. Anal. Paran., ed. 1, 576. 1965; Moldenke, Phytologia 13: 357. 1966; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 539, 553, 618, & 892. 1971; Moldenke, Phytologia 25: 229 & 230 (1973) and 28: 403 & 439. 1974; Troncoso, Darwiniana 18: 340 & 410. 1974.

Troncoso (1974) reports this species from Brazil and Paraguay. Krapovickas and his associates found it growing "in pajonal", with yellow flowers in March.

Additional citations: ARGENTINA: Misiones: Krapovickas, Cristóbal, & Maruffak 15721 (Ws).

LIPPIA INTERMEDIA var. **PARVIFOLIA** Moldenke, *Phytologia* 28: 403. 1974.

Bibliography: Moldenke, *Phytologia* 28: 403 & 439. 1974.

Citations: BRAZIL: Paraná: Hatschbach 32582 (Z--type).

LIPPIA IODOPHYLLA Schau.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Moldenke, *Phytologia* 13: 357--358. 1966; Angely, *Fl. Anal. & Fitogeogr. Est. S. Paulo*, ed. 1, 4: 835 & xi, map 1385. 1971; Moldenke, *Fifth Summ.* 1: 157 (1971) and 2: 892. 1971.

The Angely (1971) reference, cited above, is often listed as published in "1970", the erroneous title-page date.

Lindeman & Bárcia refer to this plant as a shrublet, 60 cm. tall, with rose-colored corollas "(10P8/4)", and found it growing in low woods, at an altitude of 1950 meters, flowering in July. Lützelburg encountered it on moist granite, at 2300 meters altitude, with light-rose corollas, flowering in January.

Additional citations: BRAZIL: Rio de Janeiro: Carauta, Strang, & Bárcia s.n. [Carauta 1161; Strang 1438; *Herb. Cent. Pesq. Flor-est.* 7705] (Fs); Lützelburg 6617 (Mu), 12232 (Mu). Rio Grande do Sul: Lindeman & Bárcia 6444 (Ut--320429).

LIPPIA JALISCANA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 358. 1966; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 892. 1971.

LIPPIA JANGADENSIS S. Moore

Additional bibliography: Moldenke, *Phytologia* 13: 358. 1966; Moldenke, *Fifth Summ.* 1: 156 (1971) and 2: 892. 1971.

LIPPIA JANGADENSIS var. **EITENORUM** Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 358. 1966; Moldenke, *Fifth Summ.* 1: 156 (1971) and 2: 892. 1971.

LIPPIA JAVANICA (Burm. f.) Spreng.

Additional & emended synonymy: Lantana lavandulacea Willd. in L., *Sp. Pl.*, ed. 4, 3: 319. 1800. Verbena odorata Desf. ex Steud., *Nom. Bot. Phan.*, ed. 1, 873 & 898, in syn. 1821 [not V. odorata L'Hér., 1941, nor Meyen, 1834, nor Meyer, 1946, nor Pers., 1821]. Lippia asperifolia J. H. W. Pearson ex C. A. Sm., *Common Names S. Afr. Pl.* 601, in syn. 1966. Lippia asperifolia asperifolia "A. Rich. ex Marthe" apud Raju, *Bull. Bot. Soc. Beng.* 23: 70. 1969. Lantana asperifolia A. Rich. ex Moldenke, *Fifth Summ.* 2: 535, in syn. 1971. Lantana lavandulacea Willd. ex Moldenke, *Fifth Summ.* 2: 540, in syn. 1971. Lippia javanica (Burch.) Spreng. ex Moldenke, *Fifth Summ.* 2: 557, in syn. 1971. Lippia lavandulaefolia Schwaegr. ex Moldenke, *Phytologia* 36: 44, in syn. 1977. Verbena odorata J[uss.] ex Moldenke, *Phytologia* 36: 47, in syn. 1977.

Additional & emended bibliography: Willd. in L., *Sp. Pl.*, ed. 4,

3: 319. 1800; Desf., *Tabl. Écol. Bot.*, ed. 1, 54. 1804; Willd., *Enum. Pl. Hort. Berol.* 2: 652. 1809; Desf., *Tabl. Écol. Bot.*, ed. 2, 65. 1815; Pers., *Sp. Pl.* 3: 354. 1819; Sweet, *Hort. Brit.*, ed. 1, 1: 324 (1826) and ed. 2, 418. 1830; Harv., *Gen. S. Afr. Pl.*, ed. 1, 268. 1838; Sweet, *Hort. Brit.*, ed. 3, 552. 1839; Otto & Dietr., *Allg. Gartenzeit.* 10: 315. 1842; Schau. in A. DC., *Prodr.* 11: 556, 583, 593, & 608. 1847; Buek, *Gen. Spec. Syn. Candoll.* 3: 253, 265, 266, 494, 495, & 507. 1858; Harv., *Gen. S. Afr. Pl.*, ed. 2, 291. 1868; T. R. Sims, *Sketch & Check-list Fl. Kaffr.* 63. 1894; Durand & DeWild., *Bull. Soc. Roy. Bot. Belg.* 37: 124. 1898; Baker & Stapf in Thiselt.-Dyer, *Fl. Trop. Afr.* 5: 278 & 280. 1900; E. D. Merr., *Philip. Journ. Sci.* 19: 376. 1921; Watt & Breyer-Brandwijk, *Med. & Poison. Pl. S. Afr.*, ed. 1, 154 & 235. 1932; Savage, *Cat. Linn. Herb. Lond.* 4. 1945; J. Hutchins., *Botanist South. Afr.* 294, 305, & 672. 1946; Glover, *Prov. Check List Brit. & Ital. Somal.* 268. 1947; Anon., *Chem. Abstr.* 42: 4307. 1948; Naves, *Helv. Chim. Act.* 31: 29—32. 1948; R. O. Williams, *Useful & Ornament. Pl. Zanzib.* [20], 48, 95, 332, & 360, fig. 5. 1949; Anon., *Garcia de Orta* 847—854. 1960; Costa, *Cardoso do Vale, & Maia e Vale, Garcia de Orta* 8: 299—313. 1960; Glover, Stewart, Fumerton, Marindany, & Andersen, *Gloss. Botan.-Kipsig. Names* 160 & 256. 1960; Martin & Noel, *Fl. Albany & Bathurst* 92. 1960; Dale & Greenway, *Kenya Trees & Shrubs* 588. 1961; Anon., *Hortic. Abstr.* 32: 444. 1962; Costa, *Cardoso do Vale, & Maia e Vale, Hortic. Abstr.* 32: 447. 1962; Watt & Breyer-Brandwijk, *Med. & Poison. Pl. S. Afr.*, ed. 2, 1051 & 1410. 1962; Compton, *Journ. S. Afr. Bot. Suppl.* 6: 65, 156, 176, & 179. 1966; C. A. Sm., *Common Names S. Afr. Pl.* 213, 306, 322, & 601. 1966; Amico, *Webbia* 22: 490, 498, 520, & 523. 1967; Hocking, *Excerpt. Bot. A.* 11: 103. 1967; Moldenke, *Phytologia* 14: 408—409 & 419 (1967) and 16: 184. 1968; Amico & Bavazzano, *Webbia* 23: 280 & 300. 1968; Moldenke, *Résumé Suppl.* 16: 8 & 23. 1968; Farnsworth, Blomster, Quimby, & Schermerh., *Lynn Index* 6: 264 & 267. 1969; Glover, Stewart, Fumerton, Marindany, & Andersen, *Gloss. Botan.-Kipsig. Names* 159, 160, 216, & 256. 1969; Raju, *Bull. Bot. Soc. Beng.* 23: [69]—70, fig. 1. 1969; Richards & Morony, *Check List Fl. Mbala* 238. 1969; Vander Schiff, *Check List Vasc. Pl. Kruger Natl. Park* 81. 1969; Gillett, *Numb. Check-list Trees Kenya* 46. 1970; Tweedie & Agnew, *Journ. East Afr. Nat. Hist. Soc. & Nat. Mus.* 28: 55. 1970; Greenway & Vasey-Fitzgerald, *Journ. East Afr. Nat. Hist. Soc. & Nat. Mus.* 28: 21. 1971; Ivens, *East Afr. Agric. For. Journ.* 37: 173. 1971; Moldenke, *Fifth Summ.* 1: 213, 230, 234, 237, 239, 241, 246, 248, 250, 252, 254, 255, 257, 366, & 397 (1971) and 2: 535, 539, 540, 543, 551, 552, 557, 565, 601, 652, 660, 678, 685, 686, 708, 736, 738, & 892. 1971; Anon., *Biol. Abstr.* 53 (5): B. A.S.I.C. S.146 & S.192. 1972; Danganan, *Biol. Abstr.* 54: 3953. 1972; N. F. Good, *Biol. Abstr.* 53: 2377. 1972; Moldenke, *Phytologia* 23: 432. 1972; Schaller, *Serenget. Lion* 119. 1972; Venter, *Journ. S. Afr. Bot.* 38: 231. 1972; Farnsworth, *Pharmacog. Titles* 8 (11): vii & 896. 1973; Hegnauer, *Chemotax. Pfl.* 6 [Chem. Reihe 21]: 663, 668, & 674. 1973; Jacobsen, *Kirkia* 9: 172. 1973; Neid-

lein & Stähle, Deut. Apoth.-Zeit. 113: 1219--1222 (1973) and 114: 1588--1592 & 1941. 1974; Farnsworth, Pharmacog. Titles 9 (6): vi & 504. 1974; Moldenke, Phytologia 28: 450. 1974; Asher, Guide Bot. Period. 2 (8): 23. 1975; Moldenke, Phytologia 30: 134 (1975), 34: 280 (1976), 36: 37, 44, & 47 (1977), 38: 257, 266, 386, 392--394, 401, & 405 (1978), and 39: 29. 1978.

Additional illustrations: R. O. Williams, Useful & Ornament. Pl. Zanzib. [20], fig. 5 [as "Lantana salvifolia"]. 1949; Raju, Bull. Bot. Soc. Beng. 23: 70, fig. 1. 1969.

Recent collectors describe this plant as a small, erect, woody herb, soft bush, or a rather small, spreading, open, semi-woody, thin, pubescent, aromatic shrub with a Salvia-like scent, 0.5--3.2 m. tall, but seldom exceeding 6 feet in height without support; stems very light-brownish, with gray hues, papery-scaly, dark-purple toward the top; twigs light-brown, puberulous; leaves papery-membranous, more or less gray-green or else glossy bright-green with sunken veins above and dull light-green beneath with pale, prominent, hairy veins, rough, with a pleasant spicy odor [or "fetid"] when crushed; flowers small, in round heads in the leaf-axils, strongly and characteristically aromatic, with a somewhat sour (acid) smell reminiscent of Mangifera indica, regarded as pleasant by some, unpleasant by others; calyx light-green; anthers yellow. The fruit is described as "purple" by Rodin and by Wasserfall, but this seems most unlikely.

Schweickerdt notes for his no. 1222: "bracts shorter than the flowers, 3 mm. long, 2--2.5 mm. wide, elliptic-ovate, very shortly acuminate; calyx distinctly 2-lobed or subtruncate with 4 very small teeth, 1.5 mm. long; corolla-tube 2.75 mm. long, 1--1.25 mm. diam., middle tooth of lower lip 1.25 mm. broad; stamens in 2 rows, sometimes all or 2 or 3 abortive; anthers 0.5 mm. long; ovary glabrous; style 1 mm. long". Dehn 53 includes a hand-colored painting of the plant in situ and of floral dissections on the sheet.

Dale & Greenway (1961) describe L. javanica as a "Much-branched small shrub sometimes growing to 14 ft. Stems clothed in short stiff hairs. Leaves opposite or ternate, oblong often lanceolate to narrowly elliptic to 2 in. long, margins serrulate or crenate-serrulate, upper surface rough, lower pubescent. Flowers small, white in globose or oblong subsessile heads to 1/2 in. long; corolla as long as subtending bract. Fruits small, pale brown. Widely spread [in Kenya]."

The corollas are described as having been "white" by Venter (1972) and on Bayliss BS.6251, Marques 2447, Martin 916, Mwangangi & Abdalla 261, Rau & Schlieben 9637, Rodin 3871, Wasserfall 909, Wells 1121, and Werdermann & Oberdieck 2111, "white with yellowish throat" on Bos 1243, "yellowish-white" on Strid 3470, "yellowish-white, yellow in throat" on Maas-Geesteranus 5210 & 6364, "pale greenish-creamy-white" on Scheepers 126, and "violet" by Martin & Noel (1960).

Recent collectors have found this plant growing in dry or san-

dy soil, open or coastal grasslands, secondary scrub, and grassveld scrub, along roadsides, on sandy flats, the sides of ant-hills, and hillsides protected from grazing, at altitudes of 4--2330 meters, flowering in January, February, April to July, September, and October, fruiting in January, February, April, June, September, and October.

Rodin encountered it in a "mountainous area with many springs and streams, some wooded and some grassy areas, basically dolomites and limestone covered with deep humus in many places". Maas-Geesteranus found it "scarce among tall grasses at edge of forest on grassy slopes near stream with scattered shrubs" and "rather common in savanna woodland along edge of forest with scattered Acacia lahai and extensive clumps of dense brushwood". Jacobsen (1973) refers to it as "occasional" in grassland and scrub in Rhodesia; Greenway & Vesey-Fitzgerald (1971) report it as "ruderal, invading secondary vegetation" in the Lake Manyara National Park; Compton found it on the high veld of Swaziland; while Van der Schijft (1909) calls it an "aromatic herb scattered throughout the [Kruger National] Park, common on overgrazed veld". Martius s.n. [Salgado] is labeled "Minas Gerais, Brazil" in the Munich herbarium, but surely in error. The species is not known from America. Schlieben refers to it as "abundant". Mwangani & Abdalla found it in open bushland on Eucalyptus plantations, while Marques encountered it in shrubby savannas with Maytenus heterophyllus, Sclerocarya caffra, Combretum sp., Veronia colorata, etc., and Wells found it in regenerating bush clumps on grassy slopes. Frazier reports it "frequent" on the island of Zanzibar.

Williams (1949) records the species from both Zanzibar and Pemba islands. In his work he asserts that his illustration of it is on page 19, but it is actually on p. [20]. Venter (1972) records the species from Zululand, and Amico (1967) from Zambezia, Mozambique. Raju (1969) reports it "for the 1st time from India", but his plants probably are the rather similar Asiatic L. indica Moldenke or L. unica Ramakrishn. Sweet (1839) reports it introduced into cultivation in England in 1822.

Vernacular and common names recorded for L. javanica by recent collectors and authors include "beukebos", "bokhukhwana", "chemosoriot", "fever-tree", "in-daind-ziniba", "inzinziniba", "karnet", "koorsbossie", "koorsteebossie", "lantana à feuill. de sauge", "lemoenbossie", "maagbossie", "mokinik", "mosukubyanana", "mosukutswana", "mosungsani", "mpambake", "muhuki", "mukurdu", "mumara", "mussutane", "musuzwane", "mutshwane", "mutswane", "mwende", "mwokyot", "muzireti", "ol magirigirieni", "ol-sinoni", "sulasula", "umshani-umkulu", "umsuzwana", "umsuzwane", "umzinzinibe", and "wild tea". Glover and his associates (1960) explain the derivation of some of these common names: "mwok", to shoot -- referring to plants which come up straight and quickly; but the name could apply to the straight woody stems which are used for building the walls of huts before the mud plaster is put on them".

Williams (1949) reports the leaves being used medicinally in Zanzibar; Sims (1894) also lists the species as medicinal. Smith (1966) says that it is used by the Hottentots in the treatment of "any fever". Naves (1948) found it to contain ocimene, ocimenone, and myrcenone in volatile oil. Amico & Bavazzano (1968) report: "Droghe -- Foglie: bollite sono adoperate contro i raffreddori; l'infuso è considerato febbrifugo, antimalarico, antidissenterico: è usato anche nelle malattie dell'apparato respiratorio".

Costa and his associates (1960) report its use by the natives of Angola as a vesicatory and in treating fevers. These authors give detailed chemical studies of the plant, identifying dipentene and tagetenones. No alkaloids or saponinoids were found. Both pyrogallol and pyrocatechol types of tannins were found.

Watt & Breyer-Brandwijk (1962) give the following résumé of its uses in southern and eastern Africa: "The Xhosa drink a weak infusion of the leaf and stem.....made with either milk or water, for coughs, colds and bronchial troubles in general. The leaf is variously described as having the odor of vanilla or of mint and has been used as a tea substitute.....The infusion is sometimes made with the addition of Artemisia afra and is then used also for fevers, influenza, measles and as a prophylactic against lung inflammations.....The plant is also used by the Xhosa for disinfecting anthrax-infected meat. The Kwena and the Tswana use a decoction of the leaf as a cough and cold remedy. Hewat..... states that the African uses the plant in the treatment of anthrax but that it is poisonous and the treatment is risky. There is no confirmatory evidence of the plant's toxicity but Burchell records that it is much eaten by goats.....The smoke from burning the plant is sometimes inhaled for respiratory conditions.....The Zulu drink an infusion of the leaf for 'gangrenous rectitis' and use the plant in treating measles, urticaria, and other rashes... In Rhodesia the plant is a native remedy for blackwater fever, malaria, dysenteries and other diseases.....The Masai make a red ointment which is used to decorate the body.....The plant yields a volatile oil.....Flowering tops from Tanganyika have yielded 0.4 per cent of a volatile oil rich in ocimene....Barbier...has found that the oil yields 65 to 70 per cent of a liquid $C_{10}H_{16}O$ bp 106-8° which has an agreeable odour of lemon. The Lobedu stuff the nose with the crumpled leaf to stop nasal haemorrhage and colds. The leaf, boiled in water, is a Shangana cough remedy and a Swati remedy for influenza and colds. The plant is used as a malaria remedy among the Nnquo Bushmen of South West Africa. It appears to be avoided by grazing animals.....but is reported to be eaten by them to some extent.....It contains icterogenin and has been under grave suspicion as a cause of geeldikkop..... Its ingestion by stock results in photosensitization....."

Ivens (1971) reports that when L. javanica becomes a troublesome "weed" good control may be obtained with 2,4-D ester herbicide since the "species proved relatively susceptible both to 2,4-D ester at 2.2 kg./ha. and to picloram & 2,4-D mixture at 1.1 kg./ha., the kills in May, 1970 being estimated as 80--90 per

cent with both treatments. The fire in December, 1970 influenced the results on Lippia also, but in adjacent, unsprayed areas, plants resprouted rapidly from the base of the stem after the burn."

In reviewing the much-discussed synonymy of this taxon it may be worthwhile to quote here the original description of Lippia scabra Hochst. (1845): "n. sp. 247. Lippia scabra Hochst. Foliis subsessilibus oblongis crenatis, versus basin attenuatis integerimis, supra scabris, subtus resinoso-punctatis subtomentosis, capitulis axillaribus cylindricis hirtellis, pedunculo scabro folium subaequante, drupa calyce bivalvi tecta, bipartibili. Planta aromatica (fruticosa?), Lantanae salviaefoliae Jacq. similis, ad sylvarum margines circa Natal-bai, Junio 1839 lecta."

The Verbena odorata Desf., listed in the synonymy of Lippia javanica (above), was mistakenly regarded by Steudel (1821) as a synonym of Zapania odorata Pers. which is listed by me in the synonymy of L. alba var. globiflora (L'Hér.) Moldenke. The original description of Zapania odorata Pers. (1806) is: "odorata, spic. oblongo-globosis, fol. lanceolatis crenatis rugosis scabris, caul. fruticoso: Verb. odorata H.P. V. globifera Willd. l.c. L'Herit. Strip. l. p. 23, t. 12. Z. lantanoides Lam. Hab. in Amer. meridionali. Spic. demum teretes." In my opinion, Z. odorata Pers., Verbena odorata H[ort.] P[aris.], and Zapania lantanoides Lam. are all synonyms of Lippia alba (Mill.) N. E. Br., Verbena globifera Willd. is L. alba var. globiflora, and Verbena odorata Desf. is L. javanica.

The name, Lantana lavandulacea Willd. [in L., Sp. Pl., ed. 4, 3: 319. 1800], is often quoted by authors as a synonym of Lippia alba or of Phyla scaberrima (A. L. Juss.) Moldenke, but a close examination of the original description and of a photograph of type material indicates to me that the plant so named by Willdenow is plainly Lippia javanica. Willdenow's original (1800) description is: "*11. LANTANA lavandulacea. W. L. foliis oppositis lanceolatis obtusis superne scabris, capitulis cylindraceis, bracteis imbricatis subrotundis acutis. W. Lavendelartige Lantane. W. Habitat..... f (v.v.) In hortis nostris sub nomine L. odoratae obvia, sed abunde distincta. Caulis teretiusculus scaber. Folia opposita, nunquam terna, petiolata, lanceolata obtusa, basi attenuata integerrima, obtuse dentata superne scabra, subtus hirta. Pedunculi foliis breviores. Capitula cylindracea. Bractee villosae subrotundae acutae enerviae imbricatae. Flores admodum parvi albi. W." The type actually is a specimen from a plant cultivated by Bouché at the Berlin botanical garden [Herb. Willdenow 11512]. According to Otto & Dietrich (1842) it "Ist jetzt nicht mehr im Garten. Die Blumen sind zwar weiss, aber die Pflanze scheint gar nicht zu Lantana, sondern zu Lippia oder Zapania zu gehören".

Meeuse (1942) maintains that Verbena javanica Burm. f. and

Lantana alba Mill. are conspecific and therefore the name, Lippia javanica, has priority for the American plant which we now call Lippia alba. Raju (1969) follows him in this and adopts "Lippia asperifolia asperifolia" as the name for the African plant which I regard as the true L. javanica. The two taxa are really quite distinct. Lippia javanica is not native to South America as claimed by Harvey (1868) and Raju (1969), but to eastern and southern Africa, cultivated elsewhere (e.g., France, Germany, and Java). The South American plant is L. alba (Mill.) N. E. Br. and L. alba var. globiflora (L'Hér.) Moldenke. The Indian plant of the Nilgiris, also sometimes regarded as L. javanica, is L. indica Moldenke or L. unica Ramakrishn.

Savage (1945) reports specimen 10a under genus 35, LANTANA, in the Linnean Herbarium, London, is inscribed "Verbena ind. or." in J. E. Smith's handwriting and "javanica Burm. Ind." in Linnaeus' own handwriting.

Jacobsen (1973) cites his nos. 1676 & 3376 from Rhodesia; Van der Schijff (1969) cites his nos. 54, 737, 1056, 1314, 2580, 3426, & 5014; Amico & Bavazzano (1968) cite their nos. 54, 55, & 437; Hutchinson (1946) cites his nos. 1875 & 2013. Dale & Greenway (1961) cite Bally 9815, Napier 407, Van Someren 9231, and Verd-court 973 from Kenya.

Material of L. javanica has been misidentified and distributed in some herbaria as L. adoensis Hochst., L. rehmanni H. H. W. Pearson, and Lantana salvifolia Jacq. On the other hand, the Bayliss BS.4161 and Kuntze s.n. [Kranskloof, 12/3/94], distributed and in the first case previously cited by me as L. javanica, actually prove to be L. pearsoni Moldenke, while Meebold 12830 is L. rehmanni H. H. W. Pearson, Holst 8893 is L. schliebeni Moldenke, and E. A. Robinson 6170 is L. whytei Moldenke.

The Missouri Botanical Garden photograph A.865, cited below, is of a specimen in the British Museum from the Cape of Good Hope, collector undesignated, which the photographer regarded as the type of Verbena globiflora L'Hér. [= Lippia alba var. globiflora (L'Hér.) Moldenke], but this cannot be so. L'Héritier's plant was collected in the Jardin des Plantes in Paris from seed originally sent from Buenos Aires, Argentina. The British Museum specimen, from Africa, is clearly Lippia javanica.

Additional citations: TANGANYIKA: M. Richards 25292 (Mu); Schlieben 319 (Mu). ZANZIBAR: Frazier 2293 (W--2810848). KENYA: Maas-Geesteranus 5210 (Go), 6364 (Go); Mwangangi & Abdalla 261 (Mu); Strid 3470 (Go). RHODESIA: Dehn 53 (Mu); Norlindh & Weimarck 4245 (Mu, N). MOZAMBIQUE: Lourenzo Marques: Junod 2861 (Mu, W--2646107); Marques 2447 (Mu); F. A. Mendonça 1645 (Ld); E. Sousa 157 (Ld). NIASSA: Stolz 351 (Mu--4271). NAMIBIA: Baum 250 (Mu--3918). SWAZILAND: Kemp 665 (W--2781812). SOUTH AFRICA: Cape Province: Bayliss BS.6251 (Mu); Collector undetermined s.n. [Mo.

Bot. Gard. photo A.865] (N—photo); Ecklon s.n. [Cap. b. sp.] (Mu); Krause s.n. [Natal Bay] (Mu); Krook s.n. [Penther 1792] (Mu—4072); B. E. Martin 916 (Mu); L. E. Taylor 2817 (N). Natal: Meebold 12831 (Mu), 12832 (Mu); Rudatis 618 (Mu—4272); Wells 1121 (Mu). Transvaal: Bos 1243 (Mu); Codd 6554 (Ba); Dyer 3960 (Oa); Rau & Schlieben 9637 (Mu); Rodin 3871 (Ba); Scheepers 126 (Mu); Schweickerdt 1222 (Mu); Schlieben 7011a (Mu), 8299 (Mu); Wasserfall 909 (N); Werdermann & Oberdieck 1807 (W—2583124), 2111 (W—2583182). CULTIVATED: France: Herb. Kummer s.n. [Ex horto Parisii 1834] (Mu—1192); Thouin s.n. [Ex horto Parisii] (Mu—9). Germany: Bouché s.n. [Herb. Willdenow 11512; Mus. Bot. Berol. film 1474/1 & 1474/2] (Z—photo, Z—photo); Herb. Martius s.n. [cult. 1820] (Mu—482); Herb. Schrank s.n. (Mu—11); Herb. Schreber s.n. (Mu—8); Herb. Schwägrichen s.n. (Mu—1540); Herb. Zuccarini s.n. [h. b. M. 1820] (Mu—13). LOCALITY OF COLLECTION UNDETERMINED: Martius s.n. [Salgado, "Minas Gerais, Brazil"] (Mu—10).

LIPPIA JUNELLIANA (Moldenke) Troncoso

Additional bibliography: Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; Hocking, Excerpt. Bot. A.11: 103. 1967; Moldenke, Phytologia 14: 409. 1967; Moldenke, Fifth Summ. 1: 198 (1971) and 2: 540, 553, 558, & 892. 1971; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 668. 1873; Troncoso, Darwiniana 18: 338 & 410. 1974.

Troncoso (1974) lists this species from Córdoba, La Rioja, and Tucumán. The Pierotti s.n., cited below, is a mixture with something non-verbenaceous.

Additional citations: ARGENTINA: Córdoba: Burkart 18979 (Ac, W—2568005); L. S. Smith Arg.19 (Id); Sota 734 (N); Stuckert 6707 (W—2595173). Salta: Aguilar 233 (N). San Luis: Báez 6 (W—2567983); Burkart 13960 (W—2595164); Varela 642 (N). Santiago del Estero: Pierotti s.n. [9/IV/1944] (Ut—3305778). Tucumán: Stuckert 9419 (N).

LIPPIA KITUIENSIS Vatke

Additional bibliography: J. G. Baker in Thiselt.—Dyer, Fl. Trop. Afr. 5: 276. 1900; Glover, Prov. Check List Brit. & Ital. Somal. 268. 1947; Dale & Greenway, Kenya Trees 588. 1961; Moldenke, Phytologia 12: 237—238. 1965; Moldenke, Fifth Summ. 1: 230 & 241 (1971) and 2: 557 & 892. 1971.

Baker (1900) lists Lippia kituiensis as a questionable synonym of Lantana salvifolia Jacq.; Glover (1947) lists it as a questionable synonym of Lantana rugosa Thunb.; Dale & Greenway (1961) reduce it to synonymy under Lippia ukambensis Vatke.

Additional citations: KENYA: Hildebrandt 2738 (Mu—1479— isotype, Z—isotype).

[to be continued]

THE NEW BINOMIAL MYRSINE HELLERI (MYRSINACEAE)
Hawaiian Plant Studies 68

Harold St. John
Bishop Museum, Honolulu, Hawaii, 96818, USA.

Drs. Otto and Isa Degener quite properly pointed out that the binomial Myrsine Hosakae Wilbur, (1965), given to an Hawaiian species, is a later homonym of M. Hosakae St. John in St. John & Philipson, (1962), for a species of Henderson Island. They then published for it the new binomial Rapanea Helleri, (1975). Since the writer has reduced the genus Rapanea, the following new combination is proposed for the Hawaiian tree.

Myrsine Helleri (Deg. & Deg.) comb. nov.

angustifolia (Mez) Hosaka, Bishop Mus., Occas. Papers 16(2): 42-45, fig. 6, 1940, non D. Dietr., 1839.

lanceolata (Wawra) Heller, Minn. Bot. Stud. 1: 873, 1897, non S. lanceolata (Wawra) Rock, 1913; or M. lanceolata Ettingsh., Foss. Fl. Bilin. 221, 1867-69.

sandwicensis A. DC., var. lanceolata Wawra, Flora 57: 526, 1874; and in reprint p. 104, 1874.

Suttonia angustifolia (Heller) Mez, Engler's Pflanzenreich IV, 236: 337, 1902.

Rapanea Helleri Deg. & Deg., Fl. Haw., Leaflet 2, first page, 1975.

GARDENIA WEISSICHII OF OAHU ISLAND (RUBIACEAE)
HAWAIIAN PLANT STUDIES 70

Harold St. John
Bishop Museum, Honolulu, Hawaii, 96818, USA.

The writer and his student J. R. Kuykendall published (1949) a revision of the Hawaiian species of Gardenia, three in number. The genus occurs on all six of the larger Hawaiian Islands.

On the island of Oahu, there are known two native species, G. Brighamii and G. Mannii, the latter being restricted to Oahu, but it is common on both its mountain ranges. Now at hand, is a third species, but it is not a close relative of any of the Hawaiian species. Instead, its affinity is with G. taitensis DC., the "tiare Tahiti" of the Tahitians, and a great favorite in cultivation in many lands.

In the previous publication the writer described the upward extensions of the hypanthium as calyx lobes. Now, in the studies of A. C. Smith (1974), there is a new designation of these as calyx spurs. These are conspicuous in flower and fruit, and often provide distinctions diagnostic for the species. This new morphological terminology is here accepted and followed.

Gardenia Weissichii sp. nov. Fig. 1.

Diagnosis Holotypi: Frutex vel arbor parva glabra est, foliis oppositis, ramulis foliosis 2-4 mm diametro teretibus obscure viridibus, stipulis 6-7 mm longis proxime in ocream 3-4 mm longam cylindricam chartaceam bilobatam connatis lobis 3-5 mm longis late deltoideis, petiolis 3-5 mm longis, laminis 5.7-12.5 cm longis 2.7-7.5 cm latis subcoriaceis late oblanceolatis (vel ovatis) obtusis basi cuneata decurrenti supra obscure viridibus lucidis infra pallide viridibus nervis secundariis 8-10 in dimidio quoque curvatis adscendentibus, pedicellis 7-11 mm longis adscendentibus, hypanthio 1 cm longo cuneiformato 5-anguloso, calycibus cum limbo 5 mm longo tubuloso viridi, 5 angulis in 5 calcares 25-27 mm longos 6.5-8.5 mm latos erectes

semilanceolatos obtusos projectentibus, tubo corollæ 27 mm longo subcylindrico in medio 3.5 mm diametro in fauce 7 mm albo, 6-7-lobis corollae circinnatis 23-31 mm longis 12-17 mm latis oblique ellipticis albis rotatis, suaveolentia dulci debili sed non aromatica, antheris et stigmatibus inclusis, filamentis fere in toto adnatis, antheris ex fauce projectentibus, antheris in vivo 11 mm longis 1.2 mm latis linearibus, stylo 2 cm longo tereti glabro, 5 stigmatibus 6 mm longis in corpore fusiformi circinnatis, (fructubus incognitis).

Diagnosis of Holotype: Shrub or small tree, glabrous throughout; leaves opposite; leafy branchlets 2-4 mm in diameter, terete, dark green; stipules 6-7 mm long, proximally connate into a chartaceous cylindric sheath 3-4 mm long, bilobed, the lobes 3-5 mm long, broadly deltoid; petioles 3-5 mm long; blades 5.7-12.5 cm long, 2.7-7.5 cm wide, subcoriaceous, broadly oblanceolate, (or obovate), obtuse, the base cuneate and decurrent, above shiny dark green, below pale green, secondary veins 8-10 in each half, curved ascending, domatia none; pedicels 7-11 mm long ascending; hypanthium 1 cm long, cuneiform, 5-angled; calyx limb 5 mm long, tubular, green; the 5 angles projecting into 5 spurs 25-27 mm long, 6.5-8.5 mm wide, erect, semilanceolate, obtuse; corolla tube 27 mm long, subcylindric, 3.5 mm in diameter at the middle, 7 mm at the throat, white; 6-7 corolla lobes circinnate, 23-31 mm long, 12-17 mm wide, obliquely elliptic, pure white, rotate; the fragrance faint, sweet, but not spicy; anthers and stigmas included; stamens with filaments almost wholly adnate; stamens projecting in the corolla throat; anthers when fresh 11 mm long, 1.2 mm wide, linear; style 2 cm long, terete, glabrous; 5 stigmas 5 mm long, circinnate in a fusiform body; fruit unknown.

Holotypus: Hawaiian Islands, Oahu Island, cult., July 14, 1976, Wahiawa Botanic Garden 938, derived from the wild at Oahu, Malaekahana, P. Weissich Fl.2585 (BISH).

Specimens Examined: a second flowering specimen from the type tree, Aug. 17, 1976, (BISH).

Discussion: The closest relative of G. Weissichii is G. taitensis DC., of the Lau Islands and Rotuma, and cultivated in the Society Islands, a species with the calyx spurs 12-14 mm long, 4-7 mm wide, narrowly elliptic, acute; corolla tube 30 mm long, subcylindric, 4 mm in diameter at the middle, 8 mm at the throat, the lobes 38-39 mm long, 10-14 mm wide; anthers 19-20 mm long, exserted for 5 mm; stigmas 8 mm long; flowers with an enchanting strong spicy fragrance. G. Weissichii has the calyx spurs 25-27 mm long, 6.5-8.5 mm wide, semilanceolate, obtuse; corolla tube subcylindric, 3.5 mm in diameter at the middle, 7 mm at the throat, the lobes 23-31 mm long, 12-17 mm wide; anthers 11 mm long, exserted for 2-3 mm; stigmas 6 mm long; flowers with a faint sweet fragrance, not spicy.

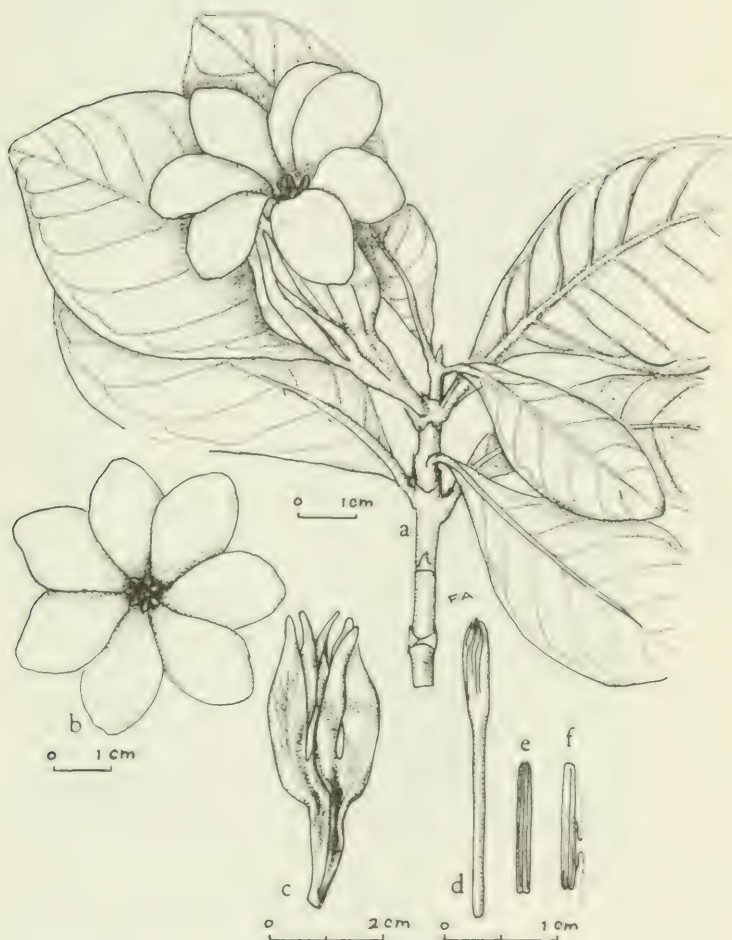
The new epithet is chosen to honor Paul Robert Weissich (1925-), director of Honolulu Botanic Gardens. He successfully brought this attractive species into cultivation.

Legend

Fig. 1. Gardenia Weissichii St. John, from holotype. a, habit, X 1; b, flower, X 1; c, calyx with spurs, X 1; d, style and stigmas, X 2; e, f, stamens, X 2.

Literature Cited

- St. John, Harold and J. Richard Kuykendall. 1949. Revision of the native Hawaiian species of *Gardenia* (Rubiaceae). Hawaiian Plant Studies 15. Brittonia 6: 431-449, figs. 1-8.
- Smith, Albert C. 1974. Studies of Pacific Island Plants XXVII. The Genus *Gardenia* (Rubiaceae) in the Fijian Region. Am. Journ. Bot. 61: 109-128, figs. 1-54.



Gardenia Weissichii St. John - Oahu, Wahiawa Botanic
Garden 938. 4/21/76 (BISH) found wild at
Malaekahana, Oahu, Hawaiian Islands

BEGONIA NOMENCLATURE NOTES, I

Begonia repens Lamarck

Jack Golding, 47 Clinton Ave., Kearny, N. J. 07032

The Species of the Begoniaceae, Edition 2, 1974, by Fred A. Barkley and Jack Golding is a compendium of the published names and published synonymy for the species and therefore continues the errors from the literature. I have been reviewing the literature to verify or correct the citations and their synonymy. My determinations will be published in this series, "Begonia Nomenclature Notes."

ORIGINAL CITATION

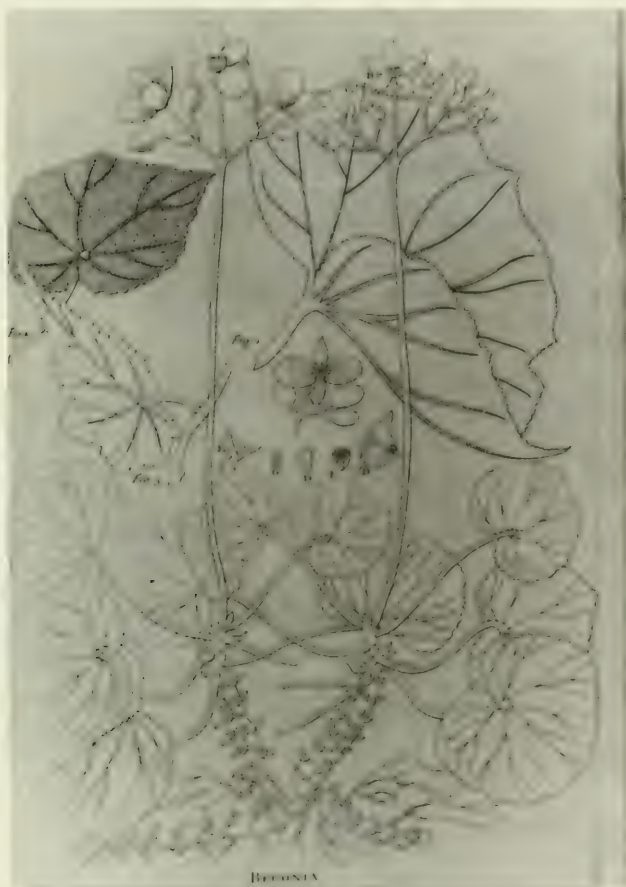
The name *Begonia repens* was first published by Jean Baptiste Lamarck in *Encyclopedie methodique. Botanique* 1: 394. 1 August 1785. He gave this name to the plant of Charles Plumier, *Begonia roseo flore, folio aurito, minor et hirsuta*, (*Begonia* with pink flower, eared leaf, smaller and hairy) listed in Joseph Pitton de Tournefort, *Institutiones* 1. (app.): 660. 1700.; in Plumier, *Nova plantarum americanarum genera*: 20. 1703; and illustrated in Plumier, *Plantarum americanarum*, Johannes Burman edit., fasc. 2; 34. t. 45. f. 2. 1756.

5. *Bégone rampante*, *Begonia repens*. *Begonia caulibus repentibus ad nodos radicosis; foliis uniauritis; pedunculis axillaribus, longis, multifloris*. N. *Begonia roseo flore, folio aurito, minor, & hirsuta*. Plum. Sp. 20. Ic. 45. f. 2.

2. *Begonia roseo flore, folio aurito, minor, & glabra*. Plum. Sp. 20. Ic. 45. f. 3.

The original citation by Lamarck

Sa racine est rampante comme celle du Chien-dent (*triticum repens*), & pousse des tiges nouvelles; couchées & étalées sur la terre, feuillées, & munies à chaque nœud de petites racines fibreuses. Ses feuilles sont alternes, pétiolées, un peu plus grandes que la paume de la main, obliques, crénelées, à un seul lobe à leur base, vertes en dessus avec beaucoup de nervures blanchâtres chargées de poils courts, & rouges en leur surface inférieure. De chacune des aisselles des feuilles supérieures, il s'élève un pédoncule long d'un pied & demi ou davantage, & qui soutient un corymbe rameux, muni de fleurs, les unes mâles & les autres femelles. Leurs pétales sont blancs & elliptiques; les femelles en ont six portés sur un ovaire rouge & à trois ailes. Leur fruit a aussi trois ailes, mais dont une est beaucoup plus grande que les autres. Les fleurs mâles n'ont que quatre pétales & de petites étamines jaunes. Cette plante croît à St. Domingue, dans le voisinage des ruisseaux. Plum. Mff.



Plantarum americanarum tabula XLV

- MAIN FIG. *Begonia roseo flore, folio orbiculari* Plumier. = *Begonia rotundifolia* Lamarck.
FIG. 1. *Begonia purpurea et nivea, maxima, folio aurito* Plumier. = *Begonia macrophylla* Lamarck.
FIG. 2. *Begonia roseo flore, folio aurito, minor et hirsuta* Plumier. = *Begonia repens* Lamarck.
FIG. 3. *Begonia roseo flore, foliis acutioribus, auritis, et late crenatis* Plumier. = *Begonia plumieri* A. DC.

[Courtesy Hunt Institute for Botanical Documentation]

The English translation by Carrie Karegeannes* follows:

5. Creeping *Begonia*. *Begonia repens*.

Begonia with creeping stems with many roots at the nodes, the leaves with one earlike lobe; the peduncles axillary, long, multiflowered. Names: *Begonia roseo flore*, *folio aurito*, *minor*, & *hirsuta* [*Begonia* with pink flower, eared leaf, smaller, and hairy]. Plumier, *Sp.*: 20. *Icones*: tab. 45. fig. 2.

Variety *beta*. *Begonia roseo flore*, *folio aurito*, *minor*, & *glabra* [*Begonia* with pink flower, eared leaf, smaller, and glabrous]. Plumier, *Sp.*: 20. *Icones*: tab. 45. fig. 3.

Its root is creeping like that of the Couch-grass (*Triticum repens*) and puts forth knobby stems, prostrate and spreading on the ground, leaved, and provided with fibrous roots at each node. Its leaves are alternate, petioled, a little larger than the palm of the hand, oblique, crenate, with a single lobe at the base, green on the upper side with many whitish veins laden with short hairs, and red on the under surface. From each of the axils of the upper leaves arises a peduncle one and a half feet long or more, which supports a branched corymb provided with flowers, some male and the others female. The petals are white and elliptic; the females carry six petals on a red ovary with three wings. Their fruit also has three wings, but one of them is much larger than the others. The male flowers have only four petals and small yellow stamens.

This plant grows in Santo Domingo, in the neighborhood of streams. Plumier MSS.

CONFUSION WITH TABULA 45

Lamarck named his variety *beta* as based on the plant of Plumier, *Begonia roseo flore*, *folio aurito*, *minor* & *glabra* (*Begonia* with pink flower, eared leaf, smaller and glabrous), and also referred to Plumier's illustration fig. 3 on tab. 45. But this was not correct as fig. 3 was based on Plumier's *Begonia roseo flore*, *foliis acutioribus*, *auritis* & *late crenatis* (*Begonia* with pink flower, with leaves more acute, eared, and broadly crenate).

*Reprinted by permission. 1976 © Carrie E. Karegeannes

An examination of the text on page 34 of *Plantarum americanarum* that pertains to fig. 2 on tab. 45 causes me to speculate that the original reference to fig. 3 might have been a typographical error.

The text is: "*Begonia roseo flore, folio aurito, minor & hirsuta. Plum. Cujus folium Fig. 2 exprimitur, hujus & altera glabra est, ejusdem penitus structuræ*," which I translate as "*Begonia* with pink flower, eared leaf, smaller and hairy Plumier, whose leaf is portrayed by fig. 2, the inner structure of this and the other, glabrous one is the same." This reference to "the other, glabrous one" is to *Begonia roseo flore, folio aurito, minor & glabra* Plumier.

Since the configuration of the hairy leaved *Begonia* and the glabrous leaved *Begonia* was the same, Lamarck named the former *Begonia repens* and the later *Begonia repens* var. *beta*. He probably intended to refer both to fig. 2 or perhaps originally var. *beta* was to shown by fig. 3, but when the figure was changed to show a different plant, the text was not corrected.

Otto E. Schulz reviewed the early *Begonia* in Urban, *Symbolae antillanae* 7: 1-29. 1911. On page 15 he gave the name *Begonia brachypoda* to Plumier's plant that Lamarck had designated as *Begonia repens* var. *beta* (excluding fig. 3 of tab. 45).

The plant of Plumier that was illustrated by tab. 45. fig. 3 was given the name *Begonia plumieri* by A. de Candolle in his *Prodromus* 15(1):295. 1864.

CITATION OF SCHULZ

Otto E. Schulz also listed on page 28, *ibid.*, *Begonia repens* Lamarck (excluding var. *beta*) under the heading of "Species not sufficiently known," and observed, "It seems this species is properly separated but until now it is yet to be found again." He referred to these citations:

1. The original by Lamarck, given above.
2. The comments by Jonas Dryander in his "Observations on the genus of *Begonia*" in *Transactions of the Linnean Society of London* 1:172. 1791. Dryander had listed *Begonia repens* Lamarck under "Obscure Species" and noted after the description, "Chevalier

Lamarck describes this with white flowers, which according to Plumier's name should be pink." Dryander also noted Lamarck's error in citing *tab. 45. fig. 3* for his variety *beta*.

Most botanists do not consider flower color to be an important characteristic in the determination of a species. I have often noted that some *Begonia* species growing in shaded areas have flowers that are white, but when the same species is grown in a sunnier location, the flowers often are tinged with pink or are completely pink.

3. Baillon, *Natural history of plants* 8:497. 1886. This reference merely lists the name *Begonia repens* Lamarck in a paragraph about the uses of *Begonia*.

CITATION OF A. DE CANDOLLE

A. de Candolle, in *Prodromus* 15 (1): 395. 1864., listed *Begonia repens* Lamarck with others under the heading, "Doubtful Species." He gave a description based on Lamarck's original description and, referring to *fig. 2* of *tab. 45.* in Plumier, *Plantarum americanarum*, he commented, "where there is only a badly drawn leaf," and that the base, according to the description, had one earlike lobe, but from the illustration [as he saw it], was peltate. The underside of the leaf, from the description, A. DC. said, was hairy at the veins, but from the illustration it was sparsely hairy. He also noted that Lamarck's variety *beta* was certainly different, not completely known, and perhaps should be referred to *Begonia wrightiana*.

De Candolle apparently considered Plumier's *fig. 2* as a view of the underside of the leaf. Perhaps that is why it looked peltate and sparsely hairy at the veins to him. I have studied the *fig. 2* and it seems to me that it is drawn as viewed from above with the one earlike lobe overlapping the other, giving it the appearance of a peltate leaf. Also, if it were a view of the underside, the petiole would not be covered by the basal lobe and would be completely visible to the point of attachment to the blade.

OBSERVATIONS OF URBAN

I. Urban in "Plumiers Leben and Schriften," Fedde, *Repertorium* 5:109. 1920., observed that tab. 125 in the book of Boerhaave (*Begonia roseo flore, folio aurito, minor et glabra* = *B. repens* var. *beta* Lam. = *B. brachypoda* O. E. Schulz) and tab. 126 (*Begonia roseo flore, folio aurito, minor et hirsuta* = *B. repens* Lamarck) are similar except for the glabrousness.

These illustrations were copies of the original Plumier drawings made by Claude Aubriet in 1733 for Herman Boerhaave and they were used by Johannes Burman for the preparation of t. 45 in the *Plantarum americanum*. It would seem that rather than showing two separate leaves from the plants of Boerhaave's t. 125 and t. 126, which were the same except for the hair or the lack of it, he showed only the one from t. 126 and referred to the other t. 125 on page 34 of the text, as noted above.

I have been trying to obtain copies of either these illustrations or the originals by Plumier, as they may show the entire plants, not just the single leaves. A look at the original illustrations of Plumier probably would also resolve de Candolle's question concerning the peltate leaf and hairiness. Stafleu, *Taxonomic literature* :360. 1967., lists the location of the original drawings and several copies.

INDEX KEWENSIS

More confusion is caused by the listing in *Index Kewensis* 1:287. 1895., that showed *Begonia repens* Lamarck as a synonym of *Begonia rotundifolia* Lamarck. Compare the above description of *Begonia repens* Lamarck with the following description of *Begonia rotundifolia* Lamarck.

7. BÉGONE à feuilles rondes, *Begonia rotundifolia*. *Begonia caulibus squamosis, apice solidis; pedunculis scaposis foliis longioribus; floribus umbellato-paniculatis*. N. *Begonia flore roseo, folio orbiculati*. Plum. Spec. 20. Tournef. 600. Burm. Amer. Tab. 45.

The original
citation by
Lamarck.

Cette Bégone paroît former une espèce tout-à-fait distincte de toutes les autres, qu'on trouve mentionnées dans les Auteurs: les tiges ne sont que des fouches épaissies, charnues, cylindriques, nues, chargées de petites écailles stipulaires qui persistent, & marquées en outre entre chaque paire d'écailles, d'autant de cicatrices qu'ont laissé les anciennes feuilles après leur chute; elles sont garnies à leur sommet de plusieurs feuilles arrondies ou réniformes, quelquefois ombiliquées, légèrement crénelées dans leur contour, vertes & luisantes en dessus, blanches en dessous, & soutenues par d'assez longs pétioles qui s'insèrent près les uns des autres. De l'extrémité supérieure de chaque fouche, s'élève un long pédoncule, ou plutôt une espèce de hampe beaucoup plus longue que les feuilles, & qui porte à son sommet des fleurs rougeâtres, monoïques & disposées en panicule umbelliforme. Cette plante croît dans l'Amérique méridionale, attachée aux rochers ou aux troncs d'arbres.

English translation by Carrie Karegeannes* follows:

7. Round-leaved *Begonia*. *Begonia rotundifolia*.

Begonia with scaly stem, full of leaves at the tip; the scapose peduncle longer than the leaves; the flowers borne in an umbellate panicle. Names: *Begonia flore roseo, folio orbiculati* [*Begonia* with pink flower, round leaf]. Plumier, *Spec.*: 20. Tournefort, : 600. Burman, *Amer. tab.* 45.

This *Begonia* would appear to form a species quite distinct from all the others that we find mentioned by the authors; the stems are merely thick rhizomes, fleshy, cylindrical, naked, laden with small stipulatory scales that persist, and marked besides between each

pair of scales by as many scars that old leaves have left after their fall. The rhizomes are furnished at their tips with several rounded or reniform leaves, sometimes umbilicate [navel-like, having a small central depression--or, Stearn says some authors use this to mean peltate; A. de Candolle cites it as "perhaps peltate?" with the question mark], lightly crenate on the margin, green and shining on the upper surface, white underneath, and supported by rather long petioles inserted close together.

From the upper end of each rhizome arises a long peduncle, or rather a kind of scape, much longer than the leaves and carrying at its tip reddish monoecious flowers disposed in an umbel-shaped panicle.

This plant grows in South America, attached to rock or to trunks of trees.

It is obvious that these are separate species that do not even resemble each other. I investigated the literature, trying to find a reason for this listing in *Index Kewensis*.

Steudel in *Nomenclature botanicus*, Ed. 1:104. 1821., listed as valid names both *B. repens* Lamarck and *B. rotundifolia* Lamarck. But in Ed. 2: 194. 1840., he listed as a valid name *Begonia repens* Arrab. [Steudel showed Fra. Antonio de Arrabida, the Editor of *Flora fluminensis*, as the author instead of Vellozo] and made *B. repens* Lamarck a synonym of *Begonia rotundifolia* Lamarck.

I reviewed the literature of *Begonia* between 1821 and 1840 trying to find a reason for this change by Steudel, but I could find none. I can only surmise that the confusion was caused by *tab. 45* of Plumier *Plant. Amer.* that showed as the main figure the complete plant of *B. rotundifolia* Lamarck and only the leaves of other *Begonia* species as *fig. 1, Begonia macrophylla* Lamarck; *fig. 2, Begonia repens* Lamarck; and *fig. 3, Begonia plumieri* A. DC.

RECENT CITATION BY URBAN

I. Urban in *Plantae Haitiensis et Domingensis VIII, Arkiv för Botanik* 23A (5): 95-96. 1930., described the *Begonia* species collected by E. L. Ekman during 1917 and determined it to be *Begonia repens* Lamarck.

Urban referred to these citations:

Begonia repens Lamarck, *Encyc.* 1:394. 1785. (excl. var. *beta*); A. DC. *Prodr.* 15 (1): 395. 1864.; O. E. Schulz in Urban, *Symb. ant.* 7:28, 1911.: *Begonia obliqua* var. *gamma* L. *Spec. plant.* 1:1056. 1753.; Descourt. *Flor. ant.* 7:331. t. 531. 1829.: *Begonia roseo flore, folio aurito, minor et hirsuta* Plum. in Tournef. *Instit. app.*: 660. 1700., Cat. :20. 1703., and ed. Burm.: 34. t. 45. f.2. 1756.

These have been discussed above except for the one by Michel Etienne Descourtilz on page 331, with t.531, in *Flore pittoresque et medicale des antilles*, Volume 7, 1829, which concerns a *Begonia* with two-colored leaves. His list of synonymy is confused and includes "*Begonia roseo flore, folio aurito major* [? probably intended as *minor*], *et hirsuta*. Pl. Sp.: 20. Icon. 45 f.2," and several other *Begonia* which have been determined as separate species. The illustration t. 531 is of an apparently upright *Begonia* that seems to resemble *Begonia minor* Jacquin, *Coll.* 1: 126. 1787; and *Icones* 3:18 t.618. 1789. The flower details seem to be copies from t.778 by Redoute used by Lamarck in *Tableau Encl.* 2 (4) 1796, to illustrate *Begonia nitida* Dryander (a synonym of *Begonia minor* Jacquin). This illustration was adopted from an earlier plate by Redoute used by L'Heritier as pl. 46 in *Stirpes novae*: 95. 1788., to illustrate *Begonia obliqua* L. (this has been determined to be *Begonia minor* Jacquin). Also, t.531 does not seem to agree with description by Descourtilz, nor the other descriptions of *Begonia repens* Lamarck as a prostrate creeping plant.

My translation from the Latin of Urban's description follows: -

Stem creeping in the soil with many roots, up to 1 cm. thick. *Stipules* ovate shortly acuminate, entire, glabrous, up to 20 mm. long and up to 10 mm. wide. *Leaves* supported on petioles attached to the base of the blade, the *petioles* 6 to 20 cm. long, covered with more or less close together hairs 3 mm. long, spreading, usually zigzag or curved inward above, 5-8 mm. wide when flattened; the *blade* 10 to 15 cm. by 6 to 12 cm. large or smaller, obliquely reniform or transversely ovate, deeply cut at the base to 1-3 cm., the inside angle closed, one side (from the petiole attachment) rounded, the other shortly and obtusely or sharply acuminate; 7 to 9 veins extending from the base, much branched and reticulately connected; margin entire or

with 1 or 2 very wide and short teeth above, as if undulate; glabrous on the upper surface, below and at the margins with moderately long hairs; crimson or green; membranous in the dry state.

Inflorescences coming from the rhizomes, the *peduncle* 10-35 cm. long, glabrous, cymosely divided twice or thrice, the inflorescences themselves ultimately up to 12 cm. long; *bracts* ovate, 12 to 8 mm. long, 8 to 4 mm. wide; *bracteoles* oblong; finely three veined, often 7 mm. long, 2.5 mm. wide. *Male flowers* with pedicels often 6 mm. long. *Sepals* broadly ovate, those on hand scarcely cordate at the base, 6 mm. long, 5 mm. wide; *petals* white, whole ones not seen, but apparently narrowly obovate; only the younger *anthers* seen, 5, oblongly linear with tip subtruncate, minutely or scarcely apiculate, filaments free, longer than the anthers. *Female flowers* on pedicels ultimately up to 17 mm. long; *petals* white, the larger ones obovate, rounded in front, 7 mm. long, 4.5 mm. wide; *styles* ultimately 4 mm. long, the lower quarter united, the column changing suddenly into 6 to 8 simple threadlike, twisted branches. *Capsules* from the side almost circular, 6 mm. in diameter; *wings* spreading at right angles, the larger one ovate-triangular, a little obtuse, gradually narrowed, 12 mm. long, 9 mm. wide at the base, smaller ones shortly triangular, 3 to 5 mm. long. *Seeds* briefly obovate, with one side rounded, the other obtuse and scarcely apiculate, dark brown, coarsely reticulate, 0.3 mm. long.

From Haiti near brooklets: Plumier (in Lamarck).

Rediscovered since the time of Plumier, on Morne de la Hotte in mountain forest on northeastern slopes, at an altitude of 800 meters, scattered, 11 June 1917: Ekman No. 171 (ster.).

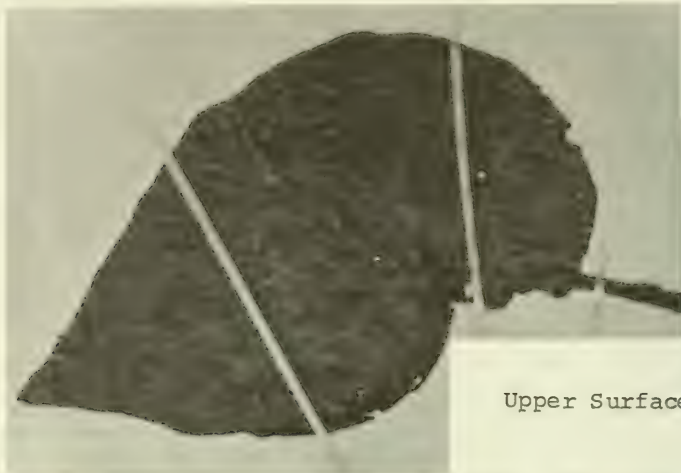
The same place in the central part near St. Louis du Sud, on the peak Bonnet-Carré, at an altitude of 1250 meters, with fruit, in the month of November: No. H 9243.

The same place in western part near Camp Perrin on northern mountains of Morne Vandervelde, frequent, in volcanic soil in the Coutard Gardens at 850-meter altitude, in December with flowers and fruit: No. H. 5220.

The same place, frequent, near Les Anglais on Morne l'Etang, at altitude of 1400 meters, month of July with flowers; No. H. 10355.

Observation. To be inserted in the arrangement of Schulz near *Begonia rotundifolia* Lam., but very different from it.

A duplicate of the Ekman specimen No. H. 5220 (less flowers and fruits) is at the U.S. National Herbarium in Washington, D.C. as U.S. No. 1412623.



Upper Surface



Lower Surface

Begonia repens Lamarck

Ekman Specimen No. H. 5220

[Courtesy, United States National Museum]

REMAINING QUESTION

There still remain some discrepancies concerning the amount and location of the hairs on the leaves.

Plumier just stated that the species was hairy.

In *tab. 45. fig. 2.*, the hairs are all over the (upper?) surface.

Lamarck, citing Plumier's manuscript, described them as, "green on the upper side with many whitish veins laden with short hairs, and red on the under surface."

A. de Candolle apparently considered *tab. 45. fig. 2.* as a view of the lower surface and seems to have read Lamarck's description as, green on the upper side, with many whitish veins laden with short hairs and red on the under surface.

I. Urban described them as, "glabrous on the upper surface, below and at the margins with moderately long hairs."

My search for a copy of Plumier's manuscript and original drawing of his *Begonia, roseo flore, folio aurito, minor & hirsuta* will continue because I think their examination would resolve the differences between the early descriptions, But, since this may require some time, I consider it best to publish these results of my study of *Begonia repens* Lamarck now.

THE CORRECT CITATION

To summarize, the name *Begonia repens* Lamarck is legitimate and correctly cited with its synonyms as follows:

Begonia repens Lamarck, Encyc. 1:394. 1785.; I. Urban
Arkiv Bot. 23A (5):95. 1930.

Begonia, roseo flore, folio aurito, minor &
hirsuta Plumier, Nov. Pl. Amer. Gen.: 20. 1703.;
Pl. Amer. 2:34. t. 45. f. 2. 1756.

Begonia obliqua var. *gamma* L. Sp. Pl. 1753.

HOMONYMS

All of the homonyms of *Begonia repens* have been renamed as follows:

Begonia repens var. *beta* Lamarck, Encyc. 1:394.
1785. (Excl. Plumier, Pl. Amer. 2:34.
t. 45. f. 3.)

=*Begonia brachypoda* O. E. Schulz, Urb. Sym.
Antill. 7:15. 1911.

Begonia repens Blume, Enum. Pl. Jav. 1:95. 1827.;
A. DC. Prodr. 15 (1): 391. 1864.

=*Begonia mollis* A. DC. Prodr. 15 (1): 391. 1864.
(not *Begonia muricata* Blume ex Backer & van
den Brink, Flor. Jav.: 309. 1963.)

Observation: Cornelius A. Backer and C. Bak-
huizen van den Brink in *Flora of java*: 309.
1963., listed as synonyms of *Begonia muricata*
Blume: *Begonia mollis* Blume [? Probably in-
tended as A. DC.], *Begonia repens* Blume, and
Begonia saxatilis Blume. I have not been able
to find any basis for this synonymy. Dr. S. H.
Koorders in *Exkursionflora von java*: 649. 1912.,
reviewed and eliminated the confusion with
Begonia muricata Blume and it is not the same
as *Begonia mollis* A. DC.

Begonia repens Vellozo, Fl. Flum. 10:t.35. 1831.;
Arch. Mus. Nac. 5:403. 1881.
=*Begonia vellosiana* Walpers, Rep. 2:216. 1843.

Observation: Walpers renamed *Begonia repens* Vellozo because he thought the name was preceded by *Begonia repens* Blume. As noted above, that name by Blume was not valid either and was later found to be a synonym of *Begonia mollis* A. DC. Nevertheless, in accordance with Article 64 of the ICBN the valid prior use of the name *Begonia repens* by Lamarck in 1785 (even if the name had later been found illegitimate, which it was not) precludes its use for any other species of the genus *Begonia*. Hence, *Begonia vellosiana* Walpers is the legitimate name and *Begonia repens* Vellozo is a synonym.

Rossmannia repens Klotzsch, Monatsb. Akad. Berl.: 125. 1854.; Begoniaceen: 99.1855.

=*Begonia rossmanniae* A. DC. Prodr. 15 (1): 333. 1864.

Begonia repens Herb. Ruizii ex Klotzsch, Begoniaceen 100. 1855. pro syn.; Ruiz & Pavon ex A. DC.

Prodr. 15 (1): 333. 1864. pro syn.

=*Begonia rossmanniae* A. DC. Prodr. 15 (1): 333. 1864.

Diploclinium repens Miquel, Fl.Ind.Bat. 1: 686. 1856.

=*Begonia mollis* A. DC. Prodr. 15 (1): 391. 1864.

Scheidweileri repens Hasskarl, Hort. Bog. Desc.: 325. 1858.

=*Begonia mollis* A. DC. Prodr. 15 (1): 391. 1864.

Mitscherlichia repens Miquel, Fl.Ind.Bat. Suppl. 1: 333. 1861.

=*Begonia mollis* A. DC. Prodr. 15 (1): 391. 1864.

Begonia repens Schott ex A. DC. Prodr. 15 (1): 365. 1864. pro syn.

=*Begonia convolvulacea* A. DC. in Martius, Fl. Bras. 4 (1): 367. 1861.

Begonia repens Liebmam ex Hemsley, Biol. Centr. Am. Bot. 1:497. 1879. pro syn.

This is an error, the reference should have been to *Begonia reptans* Bentham.

Begonia repens Sessé & Mociño, Fl. Mexic. ed. 2:219. 1894.

=*Begonia glabra* Aublet, Pl. Gui. 2:916. 1775.

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Carrie Karegeannes of Annandale, Va., for permission to use her translations, our discussions, and the editing of my draft manuscript;
Peter Karegeannes for the photographs of the Ekman Specimen No. H. 5220 in the U.S. Herbarium;
Dr. Lyman B. Smith for the information about the Ekman Specimen and his encouragement.



Begonia repens Lamarck Ekman Specimen No. H. 5220
[Courtesy, United States National Museum]

BOOK REVIEWS

Alma L. Moldenke

"THE RAND McNALLY ATLAS OF THE OCEANS" edited by Martyn Bramwell & staff & contributing authors, 208 pp., 15 full-color plates, 683 color & 163 b/w fig., & 26 tab. Rand McNally & Company, San Francisco, New York & Chicago, Illinois 60680. 1977. \$29.95 oversize.

This is truly a superb production; superb in format, content and illustration. The text includes articles by assorted expert oceanographers, etc., on the (1) mystery-shrouded origin of ocean water probably from condensed vapor from this planet's ancestral atmosphere as it cooled, oceanic plates and continental drift, sea level changes as recorded in historic times, air and water currents and tides, (2) man's navigational and sea depth explorations and marine engineering for the future, (3) life in the sea with its ecological webbing of food chains, migrations, tidal and reef life, (4) search for food, oil, minerals, energy and pollution problems, (5) descriptions of the major oceans of the world, and (6) an illustrated encyclopedia of marine life.

The very attractively prepared and arranged illustrations blend effectively with the text throughout. In expected places certain marine plants and photosynthetic processes are discussed. This book is a sea treasure!

"REGULATION OF ENZYME SYNTHESIS AND ACTIVITY IN HIGHER PLANTS" edited by H. Smith, xv & 388 pp., 124 fig. & 58 tab. as b/w illus. Academic Press, New York, N. Y. & London NWL 7DX. 1977. \$31.25 or £16.00.

This pertinent book covers the proceedings of the 12th Phytochemical Society Symposium, held at Oxford in April 1976. Regulation of enzyme synthesis, degradation and activity as affected by internal and external factors (as time, space, pH, hormones, photocontrol, isozymes, proteolytic inactivation and catalysis) are covered in the first half of the book. In the second half the principal technical problems and their possible solution are tackled (as immunochemical techniques using anti-enzyme antibodies, density labeling techniques to control enzyme levels, extraction without decomposition, affinity chromatography, sub-microscopic cytochemistry).

Progress continues because these and other reports are shared through the printed page.

"A SEASON OF BIRDS" by Dion Henderson, 87 pp. & 37 b/w plates.
Tamarack Press, Madison, P. O. Box 53705, Wisconsin 53705.
1976. \$6.95.

This is a delightful collection of essays, each with a beautiful illustration, grouped according to our seasons, and telling what is to be noticed in the backyard and beyond, especially about bird visitors. The author's observations and ecological perceptions have been well focused as an early student of Aldo Leopold. The messages of Leopold, author Henderson and wildlife artist Ripper all come through advantageously in the reading of this book.

"FOLK REMEDIES OF THE LOW COUNTRY" by Julia F. Morton, 176 pp.,
105 color illus. E. A. Seemann Publishing, Inc., Miami,
P. O. Box K, Florida 33156. 1974. \$12.95.

For 62 long-established introduced or native plants of the low country of South Carolina medical ethnobotanical information is given along with plant families, scientific and common names, descriptions, seasons for blooming and fruiting, habitat, geographical ranges beyond South Carolina, present-day and historical medical uses, toxicity and other uses, but not witchcraft stuff. The illustrations are recognizable color photographs, but not enlarged beyond easy recognition among the neighboring plants.

For many folks living isolated and often marginally on this land today these plant remedies, rather than an M.D., provide the traditional treatments for their physical ailments.

Because of the author's recognition for accuracy and careful collection of details, the information between the covers of this book need not be questioned.

"A SENSE OF THE EARTH" by David Leveson, 176 pp., 5 figs. & 28
plates as b/w illus. Anchor Natural History Books of Doubleday & Company, Inc., Garden City, N. Y. 11530 or New York, N. Y. 10017. 1972. \$3.50 paperbound.

This provocative book consists of a foreword by René Dubos and nineteen short essays by the geologist-author demonstrating "the relevance of the earth to [the reader],[showing].....that the earth, in and of itself, has direct meaning for every man...with its churning insides and wandering continents, a moon with pock-marked pebbles and gigantic craters, landscapes with deep gorges and thundering streams....There is little that man can do to improve the earth. At best he can harmonize with it, at worst he can desecrate it". There is worthwhile interesting reading here.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXIII.
A NEW SPECIES OF LOMATOZOMA.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560

The genus Lomatozoma Baker was for over a hundred years regarded as monotypic and only recently was a second species described (King & Robinson, 1975). Review of additional Brazilian specimens has now revealed yet another species having the imbricate deciduous phyllaries, flat receptacle, the lack of a carpodium and the short capillary pappus that distinguish the genus. This third species of the genus also possesses dissected leaf-blades, a character that is found to some degree in both of the other species. The new species is most distinct in the large globose glands on the undersurfaces of the leaves and by the small stipitate glands on the stems. The leaves with their few blunt lobes are more deeply dissected than either of the other species. The phyllaries lack glands on the outer surface in contrast to L. artemisiifolia Bak. but have pointed tips unlike L. andersonii K. & R. The heads also are apparently distinct in having only about 10 flowers.

Lomatozoma huntii R.M. King & H. Robinson, sp. nov.
Plantae suffrutescentes ca. 0.5 m altae plerumque inferne ramosae. Caules pallide fulvescentes subteretes striati sparse hirsuti et dense stipitato-glanduliferi. Folia opposita, petiolis 3-9 mm longis; laminae membranaceae profunde dissectae pauce bipinnatifidae 7-12 mm longae et latae in lobulis obovatis apice rotundatae supra et margine minute stipitato-glanduliferae subtus dense grosse globoso-glandulosae. Inflorescentiae paucicapitatae, pedicellis tenuibus 15-20 mm longis sparse minute stipitato-glanduliferis. Capitula cylindrica ca. 6 mm alta et 2.5 mm lata; squamae involucri imbricatae ca. 15 omnino deciduae 1.5-5.0 mm longae et 1.0-1.5 mm latae apice acutae extus glabrae. Flores ca. 10 in capitulo; corollae pallide lavandulae ca. 3.5 mm longae anguste infundibulares, tubis ca. 0.5 mm longis indistinctis glabris, faucis ca. 2.5 mm longis plerumque utrinque antrorse papillois, lobis triangularibus ca. 0.6 mm longis et 0.5 mm latis utrinque antrorse papillois extus perpauce setiferis; filamenta in parte superiore 0.25-0.30 mm longa cylindrica;

thecae ca. 0.8 mm longae; appendices antherarum ovatae ca. 0.17 mm longae et 0.15 mm latae margine crenulatae; achaenia ca. 2.5 mm longa subtricostata in costis scabrella base scabridioria; carpopodia nulla vel subnulla; setae pappi ca. 22 breves 0.5-1.7 mm longae dense scabrellae superne sensim angustiores, cellulis apicalibus argute acutis. Grana pollinis ca. 23 μ in diam. asperula.

TYPE: BRAZIL: Mato Grosso: Serra Azul, about 7 km W of the Barra do Gargas - Xavantina road, 77 km from Barra do Gargas. Sandstone conglomerate cliffs. Viscid herb, flowers mauvish white. 16.6.1966 D. R. Hunt 6011 (Holotype K, Isotype NY).

Reference

King, R. M. & H. Robinson 1975. Studies in the Eupatorieae (Asteraceae). A new species of Lomatozoma. Phytologia 32:246-249.

Acknowledgement

This study was supported in part by the National Science Foundation Grant DEB77-13457 to the senior author.

HERB. HORT. KEW

*Lomatozoma sp.*

Lomatozoma huntii R.M.King & H.Robinson, Holotype
Kew. Photo by Victor E. Krantz, Staff Photographer,
National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXIX.
NOTES ON THE GENUS SYMPHYOPAPPUS.

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The genus Symphyopappus Turcz. has been subject to various interpretations over the years since its establishment but usually has been recognized by certain similarities of habit and by the presence of a compact capillary pappus that tends to fall as a unit with the upper callous of the achene. B. L. Robinson (1913) considered the genus to be inadequately defined but retained it and later added a number of species. Some years later Steyermark (1953) did reduce the genus to synonymy under Eupatorium but no further opinions were expressed until the review by the present authors (1971b) in which the genus was recognized and placed with five other genera in the distinctive Disynaphia group. Some of the species retained in the genus in the 1971 study had not been seen at that time and the resulting concept has needed some revision. The need for additional changes make a summary of the present genus necessary. Four species have been the source of problems. Two of these have been fully reviewed previously but can be summarized here along with the others. The characters of the genus and the Disynaphia complex are also worthy of review.

Symphyopappus leptophlebia was retained in the genus in the 1971 study. The species was compared to Eupatorium crenulatum Spreng. when it was described by B. L. Robinson (1931) and proves to belong with that species in the genus Raulinoreitzia (King & Robinson, 1977a).

Symphyopappus tetrastichus B. L. Robinson was also retained in the genus in the 1971 study though the original description was adequate to suggest otherwise. The species has been examined and proves to be a monotypic genus, Goyazianthus related to Brickellia and Leptoclinium in the subtribe Alomiinae (King & Robinson, 1977b).

Eupatorium catharinense Cabrera was transferred to Symphyopappus (King & Robinson, 1974) after examination of the holotype kindly loaned by the herbarium at La Plata. The type was somewhat immature but the only problem noted was the presence of 10 flowers per head rather than the 5 characteristic of the Disynaphia group. The position of the species has remained pro-

blematical until the recent reexamination of the microscope slide of the flowers. The flowers show hairs inside the corolla and remnants of hairs from the receptacle. These and other observed characters indicate the species belongs to the Critonioid genus Neocabreria K. & R. (1978).

Two Brazilian species, Liatris brasiliensis and L. trichotoma were described by Gardner in 1846 and 1847 respectively using the parenthetical name Leptoclinium. The latter was apparently intended to refer to the subgenus Leptoclinium established by Nuttall for a Florida species in the Liatris relationship. The name Leptoclinium was taken by Bentham (1873) and used at the generic level for one of the Gardner species and this led to the erroneous citation by King and Robinson (1969) of Leptoclinium (Gardner) Bentham in Bentham & J. D. Hooker with Liatris brasiliensis Gardner as the type species. It is now obvious that both the parenthetical Gardner and the typication are to be rejected. The genus Leptoclinium must take its origin from Bentham exclusively and must include only L. trichotomum which has the form of deciduous pappus and broadened style branches specified by Bentham.

The type specimen of Liatris brasiliensis has recently been seen through the courtesy of the British Museum and in addition to its original name it bears the designation Symphyopappus brasiliensis Sch.-Bip., a combination that never seems to have been published. Since the species proves to be a Symphyopappus the validation of the combination is given below. The species is a little unusual in the genus by the large spine-like setae on the achenes.

The removal of Eupatorium catharinense from the genus Symphyopappus restores the 5-flowered heads as a consistent characteristic of the genus and the Disynaphia group. The group is believed to warrant recognition at the subtribal level.

Disynaphiinae R. M. King & H. Robinson, subtribus nov. Plantae frutescentes vel subarborescentes; folia opposita vel alternata; squamae involucri subimbricatae; flores 5 in capitulo; corollae in lobis laeves vel sublaeves; filamenta superne in parietibus cellularum valde annulate ornata; basi stylorum glabri non nodulosi, rami stylorum lineares dense papilloși. Chromosomata numerus $X = 10$.

Type genus Disynaphia Hook. & Arn.

The subtribe contains six genera, Disynaphia,

Symphyopappus Turcz., Acanthostyles K. & R., Raulino-reitzia K. & R., Graziellia K. & R. and Campovassouria K. & R., and ranges from Uruguay north to Pernambuco in Brazil and west to eastern Bolivia. A key to the genera was provided by King and Robinson (1971a).

The genus Symphyopappus as presently understood has mostly glutinous leaves with glabrous midveins prominent rather than recessed on the upper surface. The inflorescences are corymbose with branches glabrous and bearing strongly decurrent ridges. The involucre usually bears 1-2 distinct dark linear bracts at the base. The genus contains the following 12 species.

- Symphyopappus angustifolium Cabr., Nat. Mus. La Plata Bot. 19:191. 1959. Brazil.
- Symphyopappus brasiliensis (Gardner) R. M. King & H. Robinson, comb. nov. Liatris brasiliensis Gardner, in Hook. Lond. Journ. Bot. 5:461. 1846. Brazil.
- Symphyopappus casarettoi B. L. Robinson, Candollea 5: 170. 1934. Brazil.
- Symphyopappus compressus (Gardn.) B. L. Robinson, Contr. Gray Herb. n. s. 80:12. 1928. Brazil.
- Symphyopappus cuneatus Sch.-Bip. ex Baker, Mart. Fl. Bras. 6(2):367. 1876. Brazil.
- Symphyopappus decussatus Turcz., Bull. Soc. Nat. Mosc. 21:584. 1848. Brazil.
- Symphyopappus itatiayensis (Hieron.) R. M. King & H. Robinson, Phytologia 22:116. 1971. Brazil.
- Symphyopappus lymansmithii B. L. Robinson, Contr. Gray Herb. n. s. 96:19. 1931. Brazil.
- Symphyopappus myricifolius B. L. Robinson, Contr. Gray Herb. n. s. 68:6. 1923. Brazil.
- Symphyopappus pennivenius B. L. Robinson, Contr. Gray Herb. n. s. 68:7. 1923. Brazil.
- Symphyopappus reitzii (Cabr.) R. M. King & H. Robinson, Phytologia 22:116. 1971. Brazil.
- Symphyopappus reticulatus Baker, Mart. Fl. Bras. 6(2): 367. 1876. Brazil.

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- _____ & _____ 1977a Studies in the Eupatorieae (Asteraceae). CLXIV. Various notes and additions. Phytologia 37:455-460.
- _____ & _____ 1977b. Studies in the Eupatorieae (Asteraceae). CLXV. A new genus Goyazianthus. Phytologia 37:461-466.
- _____ & _____ 1978. Studies in the Eupatorieae (Asteraceae). CLXX. Additions to the genus Neocabreria. Phytologia 38:424-428.
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- _____ 1931. Records preliminary to a general treatment of the Eupatorieae, IX. Contr. Gray Herb. n. s. 96:3-27.
- Steyermark, J. A. 1953. Compositae in Botanical exploration in Venezuela. III. Fieldiana: Botany 28: 620-678.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXX.
THREE NEW CRITONOID SPECIES FROM TROPICAL AMERICA

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The following three new species are described from material that was sent to us for identification.

Asplundianthus sagasteguii R. M. King & H. Robinson sp. nov. Plantae subscandentes laxae ramosae. Caules pallidi teretes puberuli vel pilosi interdum glabrescentes. Folia opposita, petiolis 8-13 mm longis dense sericeis; laminae ovatae 4-7 cm longae et 1.5-2.6 cm latae base late acutae vel subrotundatae margine serratae apice anguste acutae minute acuminatae supra subglabrae vel sparse pilosae in nervis puberulae subtus glandulo-punctatae dense minute tomentellae et pilosulae in nervis sericeae in nervulis pilosulae 2-5 mm supra basem valde trinervatae. Inflorescentiae late dense corymbosae, ramis dense puberulis, ramis ultimis plerumque 2-4 mm longis. Capitula ca. 7 mm alta et 3 mm lata; squamae involucri ca. 25 subimbricatae valde inaequales suborbiculares vel anguste oblongae 1-5 mm longae et plerumque 1.0-1.3 mm latae margine anguste scariosae apice rotundatae extus 4-costatae glabrae. Flores ca. 10-12 in capitulo azulini; corollae 5 mm longae anguste infundibulares, tubis indistinctis ca. 2 mm longis glabris, faucis glabris, lobis triangularibus ca. 0.8 mm longis et 0.4 mm latis laevibus extus sparse glanduliferis; filamenta in parte inferiore 0.1-0.2 mm longa in parte superiore ca. 0.35 mm longa; thecae; appendices antherarum ovato-triangulares ca. 0.35 mm longae et 0.18 mm latae; achaenia 2.3-2.8 mm longa subglabra superne sparse glandulifera et minute setifera; setae pappi ca. 35 plerumque 3.5-4.0 mm apice angustiores acutae. Grana pollinis ca. 22 μ in diametro.

TYPE: PERU: Huancabamba: Piura: Canchaque- Minas Turmalina, 2250 m 23 Julio 1975, Sagastegui, Cabanillas, Dios 8273 (Holotype US, Isotype MO).

Asplundianthus sagasteguii is closely related to A. scabrifolius (B. L. Robinson) K. & R. of Peru and A. stuebelii (Hieron.) K. & R. of Ecuador but differs most notably from both by the minute dense almost hyphal blackish tomentum of the leaf undersurface. Asplundianthus scabrifolius differs further by the more

hispid stems and the more scabrous upper surfaces of the leaves, and A. stuebelii has more hirsute stems and more setiferous non-glanduliferous achenes.

Critonia iltisii R. M. King & H. Robinson, sp. nov.
Plantae frutescentes usque ad 3 m altae paucè ramosae. Caules fulvescentes vel rubrescentes teretes insiccò sulcati glabri. Folia opposita, petiolis ca. 1.5-3.0 cm longis in parte exalatis; laminae ovato-lanceolatae 12-18 cm longae et 3-8 cm latae fere ad tertio inferiore angulatae et trinervatae base anguste cuneatae in petiolis acuminate decurrentes margine superne serratae apice anguste breviter acuminatae supra subglabrae persparse pilosulae in nervis sparse puberulae subtus minute puberulae in axillis nervorum densius puberulae. Inflorescentiae terminales pyramidaliter paniculatae, ramis sparse hirsutis, ramis ultimis tenuibus plerumque 5-8 mm longis subglabris. Capitula cylindrica 13-15 mm longa et 2-3 mm lata; squamae involucri flavo-virides ca. 30 subimbricatae ca. 3-seriatae valde inaequilongae 1-10 mm longae 0.7-1.5 mm latae ovatae vel oblongo-lanceolata margine distincte anguste scariosae apice anguste rotundatae solum in apice minute fimbriatae extus glabrae 4-6-costatae. Flores ca. 6 in capitulo; corollae albae ca. 7 mm longae tubaeformes plerumque glabrae in lobis extus paucè glanduliferae et puberulae, lobis oblongis ca. 0.8 mm longis et 0.4 mm latis; filamenta in parte superiore 0.15-0.20 mm longa; thecae ca. 1.8 mm longae; appendices antherarum oblongae ca. 0.35 mm longae et 0.23 mm latae; achaenia 5.0-5.5 mm longa lanosa base angustiora; carpopodia parva; setae pappi ca. 50 plerumque 7.5-8.0 mm longae superne leniter latiores. Grana pollinis ca. 23 μ in diametro minute asperula.

TYPE: GUATEMALA: EL PROGRESO: 6-8 km S of El Progreso. Near Agua Caliente. 610 m. January 4, 1976. Hugh H. Iltis G-72 (Holotype US, Isotypes WIS, MO). Paratype: MEXICO: CHIAPAS: between San Fernando and Chalona, 1/2/49. Ida K. Langman 3832 (PH).

Critonia iltisii is distinguished by the angulate margins of the leaves and by the lanate achenes. The pubescence of the achenes would indicate closest relationship to Critonia eriocarpa (B. L. Robinson & J. Greenman) K. & R. of Oaxaca but the latter has shorter ovate leafblades without long-cuneate bases and has the involucre only 5-6-seriate lacking the distinctively numerous series of shorter basal bracts.

Grosvenoria campii R. M. King & H. Robinson, sp. nov. Plantae frutescentes vel subarborescentes usque ad 4 m altae laxae ramosae. Caules fulvescentes teretes glabri in parte minore fistulosi deinde distincte lenticelliferi, internodiis plerumque 2-6 cm longis. Folia opposita, petiolis 1.0-2.5 mm longis; laminae ellipticae plerumque 7-9 cm longae et 2.0-3.3 mm latae base cuneatae vix acuminatae margine minute subserrulatae apice abrupte breviter anguste acuminatae supra glabrae vel glabrescentes nitidae subtus pallidiores glandulo-punctatae in nervis et nervulis subtomentellae, nervis pinnatis, nervis secundariis utrinque ca. 6 sensim valde ascendentibus. Inflorescentiae late dense corymbosae, ramis et ramulis sparse tomentellis. Capitula ca. 7 mm alta et 3 mm lata in glomerulis paucicapitatis sessilia; squamae involucris subimbricatae valde inaequales 1-6 mm longae et 0.8-1.0 mm latae, squamae exteriores ovatae vel late oblongae obtusae 4-6-costatae margine anguste scariosae dense fimbriatae extus glabrae vel glabrescentes, squamae interiores anguste oblongae vel lineares facile deciduae bicostatae apice breviter acutae vel anguste rotundatae breviter fimbriatae. Flores ca. 10-15 in capitulo; corollae extus lavandulae intus albae 5 mm longae leniter infundibulares glabrae, tubis indistinctis 1.5-2.0 mm longis, lobis triangularibus ca. 0.7 mm longis et 0.4 mm latis; filamenta in parte superiore 0.2 mm longa; thecae ca. 1.5 mm longae; appendices antherarum oblongo-ovatae ca. 0.4 mm longae 0.25 mm latae obtusae; achaenia 2.0-2.5 mm longa glandulifera, carpodia breviter cylindrica ca. 0.3 mm longa; setae pappi ca. 35 plerumque 2.5-3.5 mm longae base dense confertae superne tenuiores apice vix vel leniter latiores. Grana pollinis ca. 25 μ in diametro.

TYPE: ECUADOR: CHIMBORAZO-CANAR BORDER. near Tipococha, 9,800-10,400 ft. July 7, 1945, W. H. Camp E-4068 (Holotype NY).

Grosvenori campii is intermediate in stem form, in leaf pubescence and leaf shape between the two basic types previously recognized in the genus and helps to prove their relationship. The stem is not fistulose as in G. coelocaulis (B. L. Robinson) K. & R. of Peru but has some hollow areas near the nodes. The leaves are elliptical as in G. coelocaulis but has the more pinnate venation of G. rimbachii (B. L. Robinson) K. & R. and G. hypargyra (B. L. Robinson) K. & R. of Ecuador. The leaves are pubescent below unlike G. coelocaulis but not densely so as in the two Ecuadorian species.



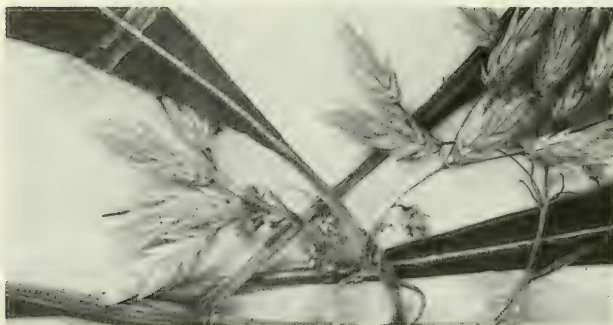
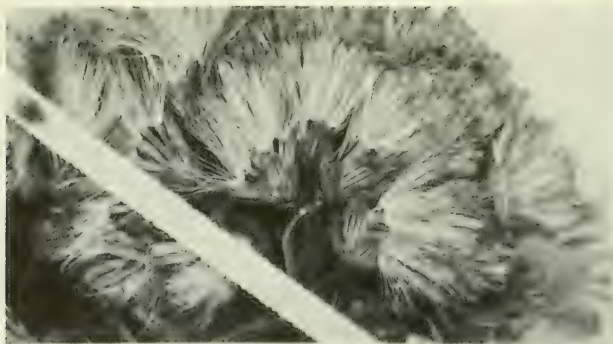
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Asplundianthus sagasteguii R.M.King & H.Robinson,
Holotype, United States National Herbarium. Photos by
Victor E. Krantz, Staff Photographer, National Museum
of Natural History.



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Critonia iltisii R.M.King & H.Robinson, Holotype,
United States National Herbarium.



Enlargements of heads. Top: Asplundianthus sagasteguii. Middle: Critonia iltisii. Bottom: Grosvenoria campii.

OUTRAGEOUSLY PRESUMPTUOUS!

AGAIN

Breadfruit, Artocarpus altilis (J.P. du Roi) Deg. & Deg.

AND

Tahiti-Chestnut, Inocarpus fagifer (J.P. du Roi) Deg. & Deg.

Otto (*kane) & Isa (*wahine) Degener

Authors, Flora Hawaiiensis

To make a long story still longer, I wish to explain that my mother's great-great-grandfather and my father's great-grandfather was the same man, to wit Friedrich Christian Ludwig Henneberg (1748-1812), Private Secretary to Duke Karl Wilhelm Ferdinand in Braunschweig (Brunswick). After Napoleon conquered the Duchy, Henneberg, under Napoleon's brother Jerome, became regent. This and more we explain in our Flora Hawaiiensis 2/15/66. French influence naturally at that time eclipsed the German. Johann Philipp du Roi (1741-1785), Court Physician (Hof-medicus) and botanist, was seven years younger than Henneberg, and hence their families evidently fraternized and danced the French minuet at the Ducal Court. How keen a physician du Roi may have been we have no way of telling; but he was a busy correspondent of the younger Linnaeus, who named the Rubiaceous genus Duroia in his honor in 1781. Du Roi published on Botany, one of his books being reprinted in several revised editions even after his death.

In 1907 (and again in 1910) my parents and I sailed from our home in New York City to visit relatives in Germany and Austria. In Braunschweig I was introduced to two elderly "Vetter" or cousins, evidently on my father's side of the family rather than on my mother's. Their names were pronounced "Dürwa," but spelled differently. Richard du Roi, the elder, held some government post in Berlin; while his younger brother (old to me) owned a cigar factory in Braunschweig. My cousins did not interest me in the least. But the younger, who lived in the suburbs, had the hobby of raising yokohama or phoenix fowl, which kept me fascinated when not interrupted by tasty afternoon coffee or chocolate with whipped cream and petits fours. Du Roi frequently won awards at Poultry Shows throughout Europe. His roosters were raised on high perches reminiscent of those to which parrots are now tethered. Thus they did not damage their tail and sickle feathers, which grew 10 to 15 feet long. To let them be dragged along the floor of a chicken coop would have been disastrous. The yokohama breed, originally from Kōchi Prefecture, is so unique that the Japanese Government in 1922 ruled it a natural monument.

*Kane, Hawaiian vernacular for "man"; wahine, for "woman."

With the above preamble ended for the present, we wish to consider the proper scientific name of the breadfruit and of the Tahiti-chestnut. For years the former taxon has gone under the name Artocarpus communis J.R. & G. Foster, Char. Gen. 101. 1776. The specific name communis is antedated, however, by altilis, the trivial name in the combination Sitodium altile. This 1773 nomen nudum of Parkinson was legalized by the mysterious botanist "Z" in his "Die Pflanzen der Insel Outahitëe, aus der Parkinsonischen Reisebeschreibung gezogen, und mit Anmerkungen erläutert von Z." Der Naturforscher 4:240. 1774. Without knowing who "Z" might be, it seems to us a bit premature or presumptuous to officially name the breadfruit Artocarpus altilis (Parkinson ex "Z") Fosb., in Journ. Wash. Acad. Sci. 31(3):95. 1939.

According to Recommendation 46C of the Code, "When a name has been proposed but not validly published and ascribed to him by another author, the name of the former author followed by the connecting word ex may be inserted before the name of the publishing author." To unburden ourselves of dead wood so to speak, we desire dropping reference to the artistic youngster Sydney Parkinson hardly out of his teens. This is in good taste, as the following shows: "If it is desirable or necessary to abbreviate such a citation," the good book states, "the name of the publishing author, being the more important, should be retained." Thus we could shorten the presumed scientific name to read Artocarpus altilis ("Z") Fosb. Yet this is prohibited according to Article 46, a mandate and not a recommendation. It states that "For the indication of the name of a taxon to be accurate and complete and in order that the date may be readily verified, it is necessary to cite the name of the author who first validly published the name concerned - - -." Realizing the "Z" is hardly a name, we consider the binomial printed in 1939 not validly published and hence ignore it.

After reading Herman Manitz' fascinating "Friedrich Ehrhart und die Publikation des 'Supplementum Plantarum' von Linné Filius." Taxon 25(2/3):305-322. May 1976, we personally pounced upon pages 305, 311, 313-315, 319 and 320, especially noting with gusto page 314. The "Z" and "Sz" stand respectively for Johann Philipp du Roi and presumably for "Sage" or "saying" of du Roi. When he published his binomial for the breadfruit du Roi was 33 years old. We here publish our version of the correct binomial, citing the original synonym beneath:

ARTOCARPUS ALTILIS (J.P. du Roi) Deg. & Deg., comb. nov.
Syn. Sitodium altile J.F. du Roi in Der Naturforscher 4:240.
1774.

Applying the same reasoning to the Tahiti-chestnut, which the kane writer knew from Fiji (Degener, O. Naturalist's South Pacific Expedition: Fiji. Pp. 76, 131, 215. 1949.), we here publish our version, with original synonym beneath:



Breadfruit

INCCARPUS FAGIFER (J.F. du Roi) Deg. & Deg., comb. nov.

Syn. Anistum fagifer J.P. du Roi in Der Naturforscher 4:230. 1774.

Continuing our preamble as a postscript to save the reader suspense, we admit that the cousins du Roi were men of character: For instance, they had not been on speaking terms for many years. When the kane's parents gave their farewell dinner to relatives and friends in the best Braunschweig hotel, we children sat at a "Katzentisch", while the du Roi brothers sat on either side of my mother at the foot of the main table. Not wishing to break their habit of silence, the du Roi's regaled each other with interesting conversation, never directly to one another, but invariably through my mother as intermediary. In the city, "Ratze", perhaps not wishing a senile end, would raise his cane and strutt through the thickest street traffic with carriage horses rearing and rubber automobile horns blaring. He would cheerily beckon us to follow with the remark: "Komm, komm, no one is allowed to run over you." He perished in the middle of Kurfürstendamm, Berlin, under the hooves of two horses during World War I; while his brother died in bed in Braunschweig, we presume, of emphysema and a cigar smoker's heart.

Now properly named Artocarpus altilis (J.F. du Roi) Deg. & Deg., and Inocarpus fagifer (J.P. du Roi) Deg. & Deg., breadfruit syn-carps and Tahiti-chestnut legumes need no longer turn in their imu graves in shame. FAX VOBISCUM to men and plants alike.

Should I ever be able to totter to a 'phone in Braunschweig and read the fine print in the Directory, I shall contact every "Henneberg," "du Roi" and "Z" listed in an attempt to unearth familial roots. This may augment the aid received from Buchheim, Braunschweig Stadtkirchenamt, Braunschweig Ordnungsamt, Fambach, Fosberg (sphalm.?), Karg, Manitz, Specht und St. John.

(Submitted for publication April Fool's Day 1978.)

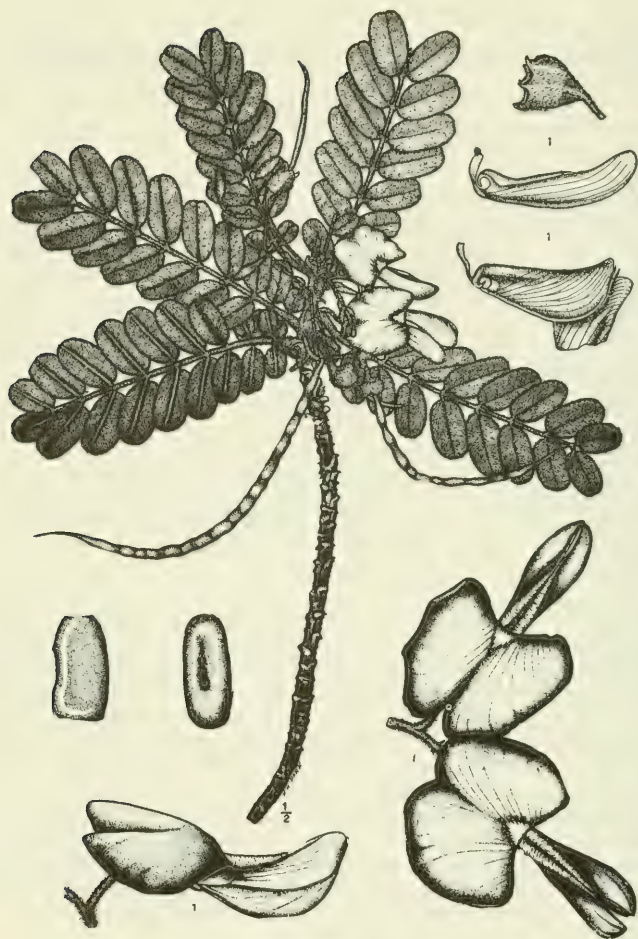
Kaena Point, Hawaiian Islands
and
A Frodromus Regarding Some Taxa In Sesbania (Leguminosae)

Otto & Isa Degener
Authors, Flora Hawaiiensis

Whether the Spaniards, while sailing their galleons before the trades from Acapulco to Manila south of the Hawaiian Archipelago and back to Acapulco north of it, ever introduced decimating diseases to the Polynesians is a moot question. But that Captain Cook later, in spite of strict precautions, introduced social and other diseases to the susceptible natives during his re-discovery of the Hawaiian Islands in 1778 is well authenticated. Cook estimated the population of the Archipelago in 1778 at 400,000, how accurately we do not know. By 1932, because of this and subsequent contacts with Europeans and their "civilization," the Hawaiians had dwindled to 124,449; by 1836, to 107,954; and by 1850, to 86,593! In 1950, by the way, the census lists only 162 pure Hawaiians, but 73,277 part-Hawaiians. At the present time the Hawaiians as a pure race are practically extinct, though fortunately many residents can proudly claim some little Polynesian blood coursing in their veins.

Not wishing to be ruler of a Nation with a dwindling population Kauikeaouli, crowned King Kamehameha III, and the Royal Hawaiian Agricultural Society, promoted the immigration of foreigners. Due to these efforts about two hundred Chinese arrived on the British bark "Thetis" January 3, 1852. These men were engaged as plantation laborers for \$3.00 per month; and were supplied with food, clothing and a house. Immigration from then on continued by leaps and bounds, especially from the Orient, from the Azores and in less numbers from Europe. In 1925 these hordes of men were earning \$30 in wages per month, with additional advantages such as free hospitalization; while the kane writer (O.D.), an immigrant from New York City, was teaching with an advanced degree Botany at the University of Hawaii with the princely salary of \$180 per month.

The above preamble shows why so many of Hawaii's older citizens and their older offspring now prominent in business, the professions and in the Legislature are hard workers, thrifty, "practical" and eminently ambitious. They are a splendid lot as a whole in spite of rather elementary training limited to the Three Rs taught in poor plantation village schools, when not interrupted by the practice of child labor. Their background too



SESBANIA TOMENTOSA Hook & Arn.

(Flora Hawaliensis)

often convinced them that if a plant no matter how scientifically or intellectually valuable or stimulating might be could not be used for fuel, medicine or food for man or beast it was worthless "grass," the Pidgin English word for "weed." Thus to most of these influential, immigrant old-timers the endemic plants, and the endemic animals that depend upon them for food and shelter, are today expendable unless they can be made into wood chips for selling to the paper industry in the Orient or can be transformed via the vegetarian food chain into exotic axis and blacktailed deer, goats, sheep, pronghorn and other herbivores available for hunters. Fortunately an increasing number of biologists more recently schooled on the Mainland and biologically akamai (clever, smart) sons and daughters of these old-timers are determined with almost missionary zeal to teach the grandchildren to appreciate "scientific and historical information" of the northwest end of Oahu, State of Hawaii. They realize that "grass," like the small sundew, has greater intellectual value than a 300 foot tall eucalyptus. They intend to end the whole-sale errors of their elders. They are beginning to retard the present ghastly slaughter of endemic plants and animals, the destruction of unique ecological features, and evidence of ancient Hawaiian culture under the crunch of the bulldozer. The King of Beasts (cf., "The Wizard of Oz") is certainly not Felis leo, but Homo sapiens!

One outstanding younger teaching group centers its activity at the University of Hawaii under the Sea Grant/Marine Advisory Program and the Hawaii Committee for the Humanities. Teacher Edward Arrigoni, author; and Marine Advisory Specialist Raymond Tabata, editor, published "A Nature Walk to Ka'ena, O'ahu" February 1977 in an edition of about 1,000 copies. This field book of 112 pages, on legal size paper, is cheaply printed by photo-offset and, at the time of writing this review, free to those who write to the University for a copy. It concentrates on a limited area of northwest Oahu jutting out toward Kauai. Slanted primarily for the use of teachers, Scout leaders and hiking groups as well as individuals, this work should gain many more than 10,000 proselytes for the appreciation and conservation of Nature.

Besides a map of the area involved, four plates and four figures, this guidebook for the six mile coastal excursion includes 56 figures of plants besides one plate and one figure of fishes. Some of the illustrations are poor due to the poor quality of paper and printing, but all are clear enough for identifying the specimens in the field. Of the 57 plants involved, 26 are naturalized and mostly weedy, about 14 are native to the Hawaiian Islands and elsewhere, and about 16 are endemic (or peculiar) to the Hawaiian Islands. Botany, in the hitherto neglected Hawaiian Islands,

is progressing rapidly thanks largely to monographers. Unfortunately Arrigoni uses for the endemic beach spurge the archaic generic name Euphorbia, when Chamaesyce must be used. Similarly, the popolo of the Hawaiians must no longer be known as Solanum nigrum L.; but according to Henderson in September 1974 (Contr. Queensland Herb. p. 33) as S. nodiflorum subsp. nutans R.J.F. Henderson. We, however, choosing to consider the taxon a variety rather than a subspecies, prefer a slightly different trinomial which may be a slight improvement or the opposite.

The loveliest plant described and figured in our only plate is the ohai, Sesbania tomentosa H. & A., s.s. (Bot. Beech. Voy. 286. 1836.), a member of the Leguminosae. It is actually a spreading tree usually only up to 3 dm., tall, a true bonsai. Its silvery, silky-pubescent leaves overshadow its greenish yellow and salmon-pink flowers. It was common in the '20s when first collected by the kane writer, but now on the verge of extinction. He knows it only from the north shore of the study area and, fearing its extermination due to cattle pastured there, scattered its seeds in the '30s about the former S.N. Castle property at the opposite end of the island at Waimanalo about forty miles distant.

A little has been published about endemic taxa of Sesbania occurring in the Hawaiian Islands, we here indulge in a mélange of scientific facts and pure speculation:

Though the hard seeds sink in ocean water, the dry legumes carrying them may float for a considerable length of time. Not only xerophytes but halophytes as well, we speculate the original sesbanias, or ohai of the Hawaiians, during the past millions of years established themselves on most if not all of the scattered large and small islands of our slender archipelago. Mingling between islands was rare enough to interfere greatly with isolation-induced speciation. We are pretty well convinced that if our many islands from Hawaii to Midway and beyond were thoroughly combed for ohai, well over a score of distinct species and strong varieties would be discovered.

Lest Vaughn MacCaughey's early observation go unnoticed, we here quote it: "A brilliant sea-shore shrub is the ohai (Sesbania tomentosa). This is a much-branching legume, six to twelve feet high; the leaves have eight to eighteen pairs of pinnae, and the large scarlet flowers are in loose axillary racemes. The natives are fond of the bright flowers, and the bush is often to be found in the vicinity of the little beach settlements, particularly along the arid leeward shores, where vegetation is scanty." (The Wild Flowers of Hawaii. Amer. Bot. 22:100.1916.) We doubt the accuracy in all cases of the specific name.

A truly definitive monograph of the Sesbania of the Hawaiian Archipelago awaits the thorough collecting of material (perhaps with the aid of the Coast Guard, the Fish and Wildlife Service and a monetary grant to visit isolated islets), discovering historical material scattered in herbaria of the World and becoming familiar with it, and growing from seeds diverse material under controlled conditions. Thereafter would follow the usual studies of gross morphology augmented by the newer ones involving chromosomes and pollen. Presently greatly handicapped, we here present our prodromus arranged by island rather than by taxon. A fully illustrated description of two pages for each species awaits publication in the Flora Hawaiiensis.

Necker: Christopherson, E., & Caum, E.L. Bull. Bishop Mus. 81: 7. 1931, record "A few plants, low and widespread along the flat top of the main part of the island; most of these less than 2 feet high, but spreading as much as 6 to 10 feet in diameter; much favored as nesting site by boobies and frigate birds."

Niihau: C.N. Forbes enumerates S. tomentosa, a determination we question, for this island in Occas. Pap. Bishop Mus. 5(3):22. 1913. Christopherson & Caum (ibid., p. 6. 1931.) report a taxon as being "Distributed all over the island but nowhere in dense stands."

Kauai: J.F. Rock, Leg. Plants Haw., on page 155, 1920 discussing the ohai, states that "on Kauai, near Mana, it is a branching erect shrub several feet in height." We suspect it extinct unless some dormant seeds should spring to life and escape straying cattle there.

Oahu: Mann, H., Flora Hawaiian Islands on page 54, 1867, states: "Hab. Waianae, Oahu, and perhaps in other parts. Puna, Hawaii, Niihau." The kane writer, residing not far from Waianae, knew about forty plants growing along the coast between Kawaihapai and Kaena Point. He kept the taxon under observation for about a decade before publishing an illustrated description of it as Sesbania tomentosa Hook. & Arn., in his Flora Hawaiiensis May 11, 1937. This is the species covered by the present field book, a plant on the verge of extinction. It is beautiful with its leaves so densely silky pubescent that the veins and veinlets of the crowded leaflets are obscure.

Molokai: Rock, discussing the ohai in his book mentioned above, reports its occurrence "on the sand dunes at Moomomi in the dry west end of that island. It forms dense mats over the white coral sands, covering quite an area." At the Bailey Hortorium, Ithaca, New York, is his specimen with an illegible date on his label that appears to be March 1909. There, also with an illegible label - we try to guard against this loss by using India ink - is Forbes' No. 604 collected at Moomomi March 24, 1915. On April 25, 1928 the kane writer collected No. 17,954, noting on the label "Flowers narrow, crimson, arid sand dune, Moomomi, Isl. Molokai." It was on the verge of extinction. As the Chilean mesquite (Prosopis) does not grow there but rather further to the lea, the voracious

Indian deer which fatten on its abundant, juicy, sweetish pods had bypassed a few plants of the ohai with its unpalatable, dry pods. This probably accounts for its survival. It is certainly a species deserving protection from extermination. Preoccupied with other matters, No. 17,954 was set aside until described with a colleague as Sesbania tomentosa var. molokaiensis Deg. & Sherff in Am. Journ. Bot. 36:502. 1949. After Mr. Allan B. Bush (1881-1960), Supt. of Grounds & Structures, University of Hawaii, raised seeds on the Campus to flowering, this antiquated disposition of the taxon proved too conservative. We therefore here rename it Sesbania molokaiensis (Deg. & Sherff) Deg. & Deg.

A second taxon of Sesbania has come to our personal attention. Please note the observations and comparisons Mr. Noak Pekelo, Jr., then of the Dept. of Agri. & Conservation at Kaunakakai (K'kai) made for us in his letter of March 19, 1961: "I have taken a keen interest in the legume Sesbania, for although this small tree is not common here, it is utilized for feed by both deer and cattle and has the ability to withstand grazing. Most of the Sesbania which I am familiar with are found growing on semi-arid ridges of central Molokai at Moomomi. The plant is growing prostrate within a patch of beach grass, the seeds and flowers of this plant are entirely different from that of the trees growing along the ridges, the seed pods are as long as the mountain plant's pod but is curved; the flowers of the beach plant appear narrower and are a deep crimson in comparison to the mountain plant. If possible I would like to receive all information possible on these plants. Should you require specimens I would be happy to collect what you may need for identification."

The Moomomi taxon we recognized to be S. molokaiensis; but we were unsure about the other and asked if we could "see it some day." We arrived on Molokai the latter part of June, whereupon Mr. Pekelo drove us east mauka (mountainward) of "K'kai" to his find. We noted the endemic, glaucous pricklepoppy (Argemone) with its white flowers and the endemic nehe (Lipochaeta) with its yellow heads, but failed to note the ohai we had come to study (Fig. 1)! Suddenly we noticed the plants thinly scattered about us. With age, most were almost invisible trees about five meters tall with slender, virgate trunks and slender, subhorizontal branches bearing a few scant tufts of leaves from which a few flowers and pods were hanging. The flowers had a pale green calyx. The standard was greenish yellow without but with faint radiating salmon streaks diffusing together particularly toward the margin; it was salmon with a dull greenish tinge within. Wings without were pale rose ending with a darker tip, with a whitish streak extending from broad base 1 mm. along lower margin to peter out two thirds from the base; it was yellowish rose within. The keel was paler rose without and had a 2 mm. wide lower margin extending half way toward the tip. The stramineous pods were arcuate, commonly 20 cm. long, 5 mm. wide and 2 mm. thick. These contained



Fig. 1. Noah Pekelo, Jr., inspecting *S. ARBOREA* (Rock) Deg. & Deg.

about 25 closely packed chocolate brown seeds 5 mm. long. The collection is Degener's & Pekelo No. 32,430. "Makakupaia Ridge, East Molokai. Arid slope with endemic *Chenopodium pekeloii*, *Lipochaeta*, *Chamaesyce*, *Argemone* etc. June 30, 1961." This ghost-like species, rarely a bit less ethereal, had been described and named by Rock "*Sesbania tomentosa* var. *arborea* Rock nov.", on his Bishop Museum herbarium sheet collected February 1919 at "Mauna Loa, Molokai."

Perhaps questioning the validity of his trinomial, Rock refers to his plant more fully in his Leg. Pl. Haw. 155, 156. 1920. His plate, incidentally, is not of *S. tomentosa* Nutt., S.S. He states that "Recently the arborescent type of *Sesbania tomentosa* has been discovered by Mrs. L.M. Dunbar on the slopes near Mahana on the west end of Molokai. She reports it as a tree 12 to 15 feet in height. The leaves are longer, the leaflets smaller and more numerous than the creeping variety [*S. molokaiensis*] on the same island at the beach sands of Moomomi. It is, however, identical

with it with the exception of being arborescent; it may be designated as Sesbania tomentosa forma arborea Rock f.n.". Rock states likewise that the species itself is on Kauai, Oahu, Molokai and Hawaii. With this statement we agree as to S. tomentosa being on Oahu only. Whether Rock's Mauna Loa plant is identical with Mrs. Dunbar's find or with our No. 32,430 is immaterial. The February 1919 specimen is the type to which Rock's trivial name belongs. We here modernize this archaic name to its proper status as Sesbania arborea (Rock) Deg. & Deg.

Lanai: While house guests of engineer Adolph Desha and his amateur botanist wife Edean, we met the talented schoolboy Robert Hobdy, now State Forester. Answering our query regarding strange plants, he lead us August 21, 1957 to the ohai which we distributed as Degener et al., No. 24,187 (Fig. 2). The label reads: "West of Kuahua Gulch at 750 ft. elev., Lanai. On arid pili-Sida-Argemone-Lipochaeta slope; about 10 S., trees remaining among some larger dead ones. No other trees of any other kind in vicinity. (1 ft. high tree with a few slender horizontal 3-5 ft. long branches; flowers pale red to orange tinged; outer surface of standard, however, greenish yellow; lower part of keel whitish; fl. fading yellowish.)" Inspection of specimens in the Bishop Museum revealed the G.C. Munro's No. 395 collected at 300 feet elevation at Kamoku was the same. Kaohai specimens, on the contrary, collected by him May 25, 1914 and again March 1915 are too coarse to be the same. We believe this latter taxon extinct. Grateful paying guests of the Dole Pineapple Company under Manager Aldridge and in part aided by the National Science Foundation we returned to Lanai to botanize from July 1963 through January 1964. We found no other ohai stand except that represented by No. 24,187, the type of the taxon here newly described and deposited in New York as:

SESBANIA HOBDYI Deg. & Deg., sp. nov. Arbor 1 m. alta; foliola tomentosa; calyce 13 mm. longo, lobis acuminatis; vexillo 32 mm. longo; alis 31 mm. longis; carina 32 mm. longa, 9 mm. lata.

This taxon, with the type No. 24,187 deposited in NY, is a miniature twiggy xerophytic dwarf tree of inland Lanai up to about 1 meter tall with some few horizontal branches extending 3 to rarely 15 dm. It superficially resembles the similarly small but more graceful halophytic S. tomentosa of coastal Oahu. Less silky pubescent, the former taxon shows the veins and veinlets of the under side of its leaves more prominently. Floral parts and coloring differ in their proportions in the two taxa, but hardly enough to excite us. Regarding the calyx, that of the Lanai plant is larger and proportionately wider, and is not gibbous at its upper back as is the Oahu plant. Both have deltoid lobes. As to corolla, the standard of the Lanai taxon is a trifle narrower, though in the distal part both are similarly orbicular. Wings and keel are a bit longer and narrower in the former. Seeds are similarly



Fig. 2. Robert Hobdy inspecting *S. HOB DYI* Deg. & Deg.

olive green. With the name briefly validated so this taxon can be officially listed as an endangered species, if not now exterminated, we have time for the preparation of a carefully executed illustrated description to accompany that of *S. tomentosa* when funds are available. The flowers are more colorful, reminiscent of those of *S. molokaiensis*.

KAHOOLAWE: One of us saw a specimen almost reduced to cigaret beetle frasse by zoologist Ball's sealing the local museum's wooden herbarium cabinets with putty against the entrance of insects in 1922. This sheet had been collected by C.N. Forbes et al., between February 10 and March 10, 1913. This shows that this island did harbor some *Sesbania*. Possibly long-viable chai seeds still in the soil might reestablish the taxon on this island were officials prodded to practice biological control to kill off the scourge of feral goats which prefer endemic to exotic plant fare. As the island is properly "off limits" to humans and has been freed of beef cattle, we facetiously (?) suggest rotating, without supplementary food the State's

prides of zoological park lions on the island. It would not only reestablish its former dry forest but save it from further wind erosion. The cost of such vacations for these genial, giant pussycats would be trivial as only a helicopter and a tranquilizer gun would be necessary to end it.

Maui: This single island, in the geologic past, consisted of two. Now, however, it is connected by a massive sandy isthmus replete until recently with endemics now largely exterminated by the sprawling community of Wailuku. It seemed truly anomalous that no one had discovered a taxon or two of ohai on East and on West Maui. So it was not surprising to receive a letter dated July 8, 1977 from Mr. Rene D. Sylva, Superintendent of a State park, with the following paragraph: "You may be interested to hear that I found an ohai (Sesbania sp.) on Maui in the Kahakuloa area, 100 yards west of Nakalele Point lighthouse. The plant had been run over by a jeep which had broken off the stem. This stem was at least two inches in diameter and the plant is prostrate on the ground in a very dry and windy location; also it is in a dying condition. Fortunately there was a part of the plant still in fairly good condition with two flowers and two seed pods on it. I managed to rescue two small seedlings and they are growing in good condition at our small Botanical Garden." Should Mr. Sylva manage to collect good material for serious study, will this coastal Maui taxon prove to be like Oahu's S. tomentosa? Seeds of both are somewhat alike in color. Or will the Maui plant, due to long isolation, be yet another novelty on the verge of extinction?

Hawaii: Kalae, the most southerly point of the archipelago, is covered by yellow Pahala ash from an enormous explosive eruption in the geologic past of Mauna Loa. The area, due to some fresh and barely potable brackish springs and to prime fishing because of rich, upwelling ocean currents, was heavily populated by the Hawaiians in spite of the arid climate. Stone salt pans (Fig. 3), some papamu (native checkerboard) and house sites are scattered about. Ka Heiau o Kalalea (Fig. 4) is near the tip. It is a heiau ho'oulu, constructed to induce the gods to increase the reproduction of three species of fishes: ahi (tuna), malolo (flyingfish) and opelu (mackerel). This temple still has a crude altar. Fishermen, of course, no longer believe in the gods of their ancestors - well, on second thought, the fish might bite just a bit better with a can or two of beer left on the altar. Today we notice mostly Kirin and Schlitz brands. After the rediscovery of the Islands by Captain Cook in 1778, a stone wall was constructed enclosing a strip of the western part of Kalae almost half a mile long and 75 feet wide. Protected from timid feral goats day and night by the presence of fishermen and from pastured cattle by the stone fence, this area was outstanding by harboring a dense forest of dwarf trees, reminiscent of some famed dwarf willow forests in Scandinavia.



Fig. 4. Ka Heiau o Kalalea or temple.



Fig. 3. Ancient stone salt pan for evaporating sea water.

The dwarf forest at Kalae consisted of an undescribed ohai with a single trunk mostly about 1 dm. high from which spreading branches extend horizontally. The Hawaiians, as we know from MacGaughey, prized such plants. A few ohai, we found, grew sporadically for miles along the coast to the East where protected from cattle by a few jagged rocks, or by rock shelters hastily constructed by fishermen as protection from the wind. With a little imagination one can visualize that such a forest, stretching uninterrupted except by a few aa lava flows, must have retarded the Pahala ash from blowing out to sea before the introduction of herbivores. Our finds are by no means the first. Lt. Cliver S. Picher, in his letter of December 10, 1938, was quite explicit and eloquent in describing the taxon and where it grew at "South Cape. - - - The flowers were more saffron- than salmon-colored and so startling that even a ham like me stopped and examined them. If what I gathered would be of any interest to you, I will send it to you." According to G.O. Fagerlund & A.L. Mitchell (Nat. Hist. Bull. 9:41. 1944.) of the National Park their specimens came "from a dense colony at Apua Point." Ranger Donald W. Reeser in his memorandum of November 5, 1971 reports that "The only colony of this plant in the Park is near Apua Point. Seeds germinate easily. - - -. This is an important plant to try to get established at various parts of the coast."

About a year ago Mr. Reeser discovered an ohai in the Park at several thousand feet elevation inland. The material was too fragmentary for us to be certain whether differences between it and the coastal taxon were ecologic or genetic. Comparison a few years hence of plants grown side by side from seed at the Park greenhouse should solve the puzzle.

Impressed at the time by C. Brewer & Company's little museum at Punaluu catering to tourists visiting their attractive dining room near a black sand beach, and the promise of elaborate landscaping; we described this coastal taxon in manuscript as S. tomentosa var breweri Deg. & Deg. We prematurely distributed type (NY) and cotypes extensively with the following on the label: "Degeners & Piccos 32,425. Ubiquitous & thriving only near shark [sic] heiau, Kalae or South Point, Kau Desert, Hawaii. Halophyte growing on Pahala ash 100 feet from ocean. Feb. 23, 1968." We later resolved to change this trinomial because of our shock in noting the bulldozing of large tracts of rare and endangered endemics for replacement with pretty uninteresting exotics quite out of place for tourists interested in matters authentic Hawaiian. To make matters worse, the attractive and instructive museum was destroyed by the tsunami of November 29, 1975. After biology teacher John Obata kindly raised our Kalae seeds to flowering in his Honolulu garden next to Oahu's S. tomentosa we were convinced the Island of Hawaii taxon to be a distinct species. Had it occurred on several islands of

our group, we would name it S. sandwicensis. Convinced it is restricted to the "Big Island," with its yellow seeds approaching the color of Pahala ash, we briefly describe and name it for convenient "Red Book" listing:

SESBANIA HAWAIIENSIS Deg. & Deg., sp. nov. Arbor 1-2 dm. alta;
foliola supra glabra sed subtus glabrata; calyce 15 mm. longo,
8 mm. alto, lobis acuminatis; vexillo 31 mm. longo, 23 mm. lato;
alis 32 mm. longis; carina 32 longa, 9 mm. lata. Semina flavo-
brunnea.

Low spreading leafy tree rarely 2 dm. tall, with glabrate branches yellowish and somewhat silky tomentose when young. Leaves up to 17 cm. long and 5 cm. wide; petiole and rachis somewhat silky tomentose; leaflets not crowded and overlapping, with veins and veinlets evident on both surfaces, glabrous above, glabrate below. Calyx 15 mm. long, 8 mm. high, gibbous at upper base, with lobes acuminate. Corolla with standard 31 mm. long, 23 mm. wide, with distal part ovate and retuse; wings 32 mm. long, 6 mm. wide; keel 32 mm. long, 9 mm. wide. Seeds more or less orange brown.

A more recent visit to *Kalae to photograph the area for this article was shocking. The stone wall enclosing shrine and dwarf ohai forest had been breached in two places. This vandalism allowed hungry Hereford cattle, ranging over the Pahala ash covered with bitterly poisonous Portulaca cyanosperma Egler and sparse grasses to defile the shrine and to annihilate the forest. In this half mile stretch not even a plant remained fit for an herbarium specimen, though the yellow ash was fortunately sprinkled with its viable, orange brown seeds. It is so inconsistent that today part-Hawaiians, even at the loss of life, are making such a notorious hullabaloo about political niceties regarding the Island of Kahoolawe used by the United States Navy to prepare us against aggression, yet ignore Kalae sacred to their Polynesian forebears and the home of a genus of plants cherished by them. It seems an embarrassingly ridiculous paradox that this vandalism is tolerated, of all groups, by the Hawaiian Homes Commissioners, custodians we were told, of this outstanding area! Perhaps in this age of enlightened young men, a cattle proof fence with turnstile will be constructed for the protection of ten acres about the heiau, and the area established as a State Monument or Park with an attendant. Thanks to the viable ohai seeds lying in and on the ash, the bonsai forest would spring up and begin to flourish within five years. The area would cater to residents as well as to tourists and to military personnel like Lt. Picher. As these strangers will be the major source of income for our State in the future, from a purely mundane standpoint if not from an intellectual one, why not add one more worthy place of interest for them to visit?

The above discussion, stimulated by the Arrigoni field book here reviewed shows, as in the genus Hibiscus (Phytologia 35(6): 459-470. 1977.), how little is known about most phanerogams native to the Hawaiian Archipelago. Our knowledge of most lower groups is still more conspicuous by its superficiality. Fortunately some younger residents such as Arrigoni, Hobdy, Obata, Sylva and Tabata are helping educate our youth to retard the extermination at least of some of our Islands' unique Creations. Perhaps blinded by the old fable that the grass is greener on the other side of the fence, it is high time older residents realized that stone-dead mars and moon do not compare intellectually, scientifically and economically in importance with the Hawaiian Archipelago with its rapidly evolving endemic biota. Let us all strive to maintain it.

 *For nonbotanical information consult the Bishop Museum's Pacific Anthropological Records 6-9:1-126. 1969.



Fig. 5. *S. HAWAIIENSIS* Deg. & Deg.

NOTES ON NEW AND NOTEWORTHY PLANTS. CX

Harold N. Moldenke

SYNGONANTHUS UMBELLATUS f. *PROLIFERENS* Moldenke, f. nov.

Haec forma a forma typica speciei capitulis fructiferis saepe proliferentibus recedit.

This form differs from the typical form of the species in having at least some of its fruiting-heads more or less proliferous with clusters of green, linear, leaf-like structures to about 1 cm. long issuing from the center or from one side.

The type of the form was collected by Bassett Maguire, Julian A. Steyermark, and Celia K. Maguire (no. 53542) on a wet savanna 2 km. south of Río Chibau, on the righthand bank of the Río Chicanán, Bolívar, Venezuela, at 100 meters altitude, the "flowering heads gray-white", on September 1, 1962, and is deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS UMBELLATUS f. *STELLARIS* Moldenke, f. nov.

Haec forma a forma typica speciei bracteis involucrentibus saepe elongatus linearibus foliaceis usque 1 cm. longis stellato-radiatis recedit.

This form differs from the typical form of the species in having some of its fruiting-heads subtended by an involucre or semi-involucre composed of 2—10 stellately radiating, green, foliaceous, linear-elongate bracts to about 1 cm. long.

The type of the form was collected by James L. Zarucchi (no. 2048) in wet open areas in a low-tree forest adjacent to open savannas at Mitú and vicinity along the Río Vaupés at Circassia, Vaupés, Colombia, on September 14, 1976, and is deposited in my personal herbarium.

VERBENA WRIGHTII var. *INTERMEDIA* Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum ovatis irregulariter inciso-lobulatis lobulis antrorsis acutis recedit.

This variety differs from the typical form of the species in having its leaf-blades ovate in outline, marginally merely incised-lobulate, the lobules antrorsely ascending, broad, short, and apically acute.

The type of the variety was collected by Noel H. and Patricia K. Holmgren (no. 6784) in a pinyon-juniper-oak woodland on an open southwest-facing slope, at 5000 feet altitude, on the Baboquivari Trail, Baboquivari Mountains, 19 airline miles east-southeast of Sells, T. 19 S, R. 7 E, m Sec. 15, Pima County, Arizona, on April 13, 1973, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors assert that the plant was "locally common to frequent", the corolla pink, withering blue. The calyx characters are those of *V. wrightii* A. Gray, but the foliage is reminiscent of that of *V. gooddingii* var. *nepetifolia* Tidestr.

ADDITIONAL NOTES ON THE GENUS LIPPIA. VIII

Harold N. Moldenke

LIPPIA LACUNOSA Mart. & Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 13: 359. 1966; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 553, 557, & 892. 1971; Moldenke, Phytologia 27: 66. 1973; Moldenke, Biol. Abstr. 57: 3780. 1974; Moldenke, Phytologia 28: 193 & 439. 1974; Troncoso, Darwiniana 18: 339 & 410. 1974; Moldenke, Phytologia 36: 44. 1977.

Recent collectors describe this plant as an arborescent, few-branched, erect subshrub or shrub, 0.5—3 m. tall, the leaves very stiff, asperous, fragrant, the inflorescence terminal, rosy, the bracts green, and the flowers strong-scented "with the scent of pawpaw". Héringier says "ramos cheirosos". They have found it growing in dry open cerrado subject to annual burning, in "cerrado na marge de mata ciliar, solo brejoso", in gallery forests, cerrado, and the cerrado zone at the edges of streams, in dry red soil, and on rocky campos and wet slopes, at 450—1150 m. altitude, flowering from May to November, fruiting in August and September. Anderson found it in cerrado in an area of gallery forest along streams and brejo (sedge meadow), cerrado on the slopes above, the soil sandy, and the rocks sandstone. Lindeman & Haas encountered it in cerrado with many shrubs in red sandy loamy soil. Irwin and his associates report it "common but few in flower in meadows" and "occasional in cerrado and fields on limestone slopes". Maguire and his associates refer to it as "frequent". Hatschbach encountered it in "solo brejoso junta ao rio".

The corollas are described as having been "pink" on Irwin & al. 8968, "pink-purple" on Irwin & al. 18022, "rose" on Héringier 13829, 14656, & 14713b, "lilac" on Hatschbach 32403 & 37599, "lavender with orange throat" on Irwin & al. 5201, "purple with yellow eye" on Anderson 9747, "purplish" on Hunt & Ramos 6256, "violet with yellowish throat" on Lasseigne 4346, "violet, center pale yellow" on Lindeman & Haas 6063, "whitish, interior of tube yellow" on Hatschbach 27358, and "lilás-avermelhado" on Murça Pires & al. 9409.

Material of this species has been misidentified and distributed in some herbaria as L. rotundifolia Cham., L. rotundifolia Cham. & Schlecht., or Lantana sp. On the other hand, the Irwin, Maxwell, & Wasshausen 20509, distributed as L. lacunosa, actually is the type collection of L. petiolata Moldenke, a very closely related taxon.

Additional citations: BRAZIL: Distrito Federal: Héringier 8529/723 (W—2564107), 13829 (N), 14656 (N), 14713b (N); Hunt & Ramos 6256 (N), 6658 (N); Irwin, Grear, Souza, & Reis dos Santos 18022

(Ac, N); Irwin & Soderstrom 5201 (Ld, N); Irwin, Souza, & Reis dos Santos 8968 (N); Lasseigne 4346 (Ld, N); Lindman & Haas 6063 (Ut—320426); Macedo 3313 (N); Maguire, Murça Pires, Maguire, & Silva 57017 (Ld, N, N); Murça Pires, Silva, & Souza 9409 (Z).
Mato Grosso: W. R. Anderson 9747 (N); Hatschbach 32403 (Ld), 37599 (Ld). Minas Gerais: Hatschbach 27358 (Ld, W—2744642); A. Lutz 1095 (Z); Martius s.n. [in campis editis deserti, Jul. 1818] (Mu—51, Z); J. E. Pohl s.n. [in Brasilia] (Mu—568).

LIPPIA LACUNOSA var. **ACUTIFOLIA** Moldenke, *Phytologia* 27: 66. 1973.

Synonymy: Lippia lacunosa var. ovatifolia Moldenke, *Phytologia* 28: 439, nom. nud. 1974.

Bibliography: Moldenke, *Phytologia* 27: 66 (1973) and 28: 439. 1974; Moldenke, *Biol. Abstr.* 57: 3780. 1974; Moldenke, *Phytologia* 36: 44. 1977.

Citations: BRAZIL: Minas Gerais: Hatschbach 27360 (Z—type).

LIPPIA LANATA Walp.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Moldenke, *Phytologia* 12: 239—240. 1965; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 892. 1971.

LIPPIA LANTANIFOLIA F. Muell.

Additional bibliography: Moldenke, *Phytologia* 13: 359. 1966; Moldenke, *Fifth Summ.* 1: 347 (1971) and 2: 892. 1971.

LIPPIA LASIOCALYCINA Cham.

Additional synonymy: Lantana lasiocarycina Goodland, *Phytologia* 20: 78, sphalm. 1970. Lippia lasyocalycina Cham. ex Moldenke, *Phytologia* 26: 374, in syn. 1973.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; R. C. Foster, *Contrib. Gray Herb.* 184: 170. 1958; Hocking, *Excerpt. Bot. A.7:* 455. 1964; Angely, *Fl. Anal. Paran.*, ed. 1, 576. 1965; Hocking, *Excerpt. Bot. A.10:* 271 (1966), *A.11:* 103 (1967), and *A.12:* 423. 1967; Moldenke, *Phytologia* 14: 409. 1967; Goodland, *Phytologia* 20: 78. 1970; Angely, *Fl. Anal. & Fitogeogr. S. Paulo*, ed. 1, 4: 835 & xi, maps 1385 & 1386. 1971; Moldenke, *Fifth Summ.* 1: 156, 183, & 186 (1971) and 2: 541 & 892. 1971; Harley, *Kew Bull.* 28: 121 & 122. 1973; Troncoso, *Darwiniana* 18: 339 & 410. 1974; Moldenke, *Phytologia* 31: 384 (1975) and 39: 79 & 80. 1978.

Recent collectors describe this plant as a simple and unbranched subshrub or shrub, or as an erect woody herb, 0.75—2 m. tall, with one or two thin erect stems, woody roots, and a "green and incomplete involucre", and have found it growing in pastures and in cerrado and burned-over cerrado, at 300—1000 m. altitude, flowering from August to October, fruiting in October. The Eitens encountered it in "dense cerrado scrub, the soil mostly made up of laterite pebbles" and in "cerrado with scattered burned living trees to 10 m. spaced 6—30 m. apart, the ground-cover mostly

a bunch-grass". They report it "frequent", but Goodland refers to it as only "occasional".

The corollas are said to have been "lilac" in color on Hatschbach 38995, "rose-violet" on Irwin & Soderstrom 7156, "dark-lilac, whitish inside the tube" on Hatschbach 27123, "mauve with white center" on Goodland 21, and "magenta, tube white" on Irwin & Soderstrom 6726. On the Eitens' no. 2230 the corollas are described as "outer part of top of limb purple, near throat white, inside tube yellow, outside tube cream" and on their no. 8335 "light-violet with throat darker violet or light-violet with golden-yellow throat bordered by a whitish band".

Troncoso (1974) lists this species as from Bolivia, Paraguay, and Brazil. The Angely (1971) publication cited above is sometimes cited by its erroneous title-page date of "1970". The Irwin & Soderstrom 7115, cited below, is a mixture with L. gardneriana Schau.

Material of L. lasiocalycina has been misidentified and distributed in some herbaria as L. gardneriana Schau., Stachytarpheta reticulata Mart. & Schau., and Hyptis sp.

Additional citations: BRAZIL: Goiás: Irwin & Soderstrom 7115 in part (N), 7156 (Ac); Prance & Silva 58522 (S). Mato Grosso: Eiten & Eiten 8335 (W—2757727); Hatschbach 32005 (Ld); Irwin & Soderstrom 6640 (N), 6726 (Ld, N); Nienstedt 222 (Ac). Minas Gerais: Hatschbach 38895 (Ld). Paraná: Hatschbach 27123 (Ld, N). São Paulo: Eiten & Eiten 2230 (Ba, N); Goodland 21 (N), 40 (N). PARAGUAY: T. Rojas s.n. [Hassler 10630] (Ca—950437). MOUNTED ILLUSTRATIONS: Mart., Fl. Bras. 9: pl. 39 (dext.). 1851 (N, Z).

LIPPIA LASIOCALYCINA var. SAINTHILAIREI Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.10: 271 (1966), A.11: 103 (1967), and A.12: 423. 1967; Moldenke, Phytologia 14: 409. 1967; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 892. 1971; Moldenke, Phytologia 31: 384. 1975.

Recent collectors refer to this plant as an "herb-shrub with woody shoots to 1.5 m." tall, and have found it growing in deciduous forests on limestone soil, flowering in October and November. The corolla is said to have been "pale-lilac with yellow throat" on Ratter & al. 2643. Lützelburg reports the vernacular name, "camara", a name also applied to many species of Lantana.

Material of this variety has been misidentified and distributed in some herbaria as Lantana sp. It is very similar in appearance to Lippia phryxocalyx Briq.

Additional citations: BRAZIL: Bahia: Lützelburg 4085 (Mu). Minas Gerais: Ratter, Fonsêca, & Castro R. 2643 (N).

LIPPIA LASIOCALYX Herzog

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 254. 1922; R. C. Foster, Contrib. Gray Herb. 184: 170.

1958; Moldenke, Phytologia 12: 252—253. 1965; Moldenke, Fifth Summ. 1: 183 (1971) and 2: 892. 1971.

LIPPIA LAXIBRACTEATA Herzog

Synonymy: Lippia hickenii Troncoso, Darwiniana 10: 69—72, fig. 1. 1952.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 44: 254. 1922; Troncoso, Darwiniana 10: 69—72, fig. 1. 1952; Cabrera, Bol. Soc. Argent. Bot. 5: 96. 1953; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; G. Taylor, Ind. Kew. Suppl. 12: 82. 1959; Moldenke, Résumé Suppl. 7: 6. 1963; Moldenke, Phytologia 12: 148, 170, 202—203, & 253 (1965), 12: 496 (1966), and 13: 356. 1966; Troncoso, Darwiniana 14: 638. 1968; N. F. Good, Biol. Abstr. 50: 9661. 1969; Moldenke, Fifth Summ. 1: 156, 183, & 198 (1971) and 2: 556 & 892. 1971; Troncoso, Darwiniana 18: 337 & 410. 1974.

Illustrations: Troncoso, Darwiniana 10: 70, fig. 1. 1952.

Troncoso (1968) cites the following: BOLIVIA: Tarija: Herzog 1108 [Macbride photos 20330] (Le—type). ARGENTINA: Catamarca: Castillón 950 (ML—32690). La Rioja: Parodi 14864 (Si). Santiago del Estero: Castellanos s.n. [3—XII-1943] (Inst. Bot. Agric. I.N.T.A. 47556). Tucumán: Dinelli s.n. [1—XII-1906] (ML—32367).

Recent collectors describe this plant as a shrub, 0.5—2.5 m. tall, and have found it flowering in May, June, and November, fruiting in November. The corollas are said to have been "white" on Krapovickas & al. 19115 and Murça Pires 58039 and "yellowish-white" on Pflanz 932.

Additional citations: BRAZIL: Minas Gerais: Murça Pires 58039 (N). BOLIVIA: Tarija: Herzog 1108 [Macbride photos 20330] (Mu—isotype); Krapovickas, Mroginski, & Fernandez 19115 (Z); Pflanz 932 (Mu, Z).

LIPPIA LEPIDA Moldenke

Additional bibliography: Moldenke, Phytologia 12: 253—254. 1965; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 892. 1971; Moldenke, Phytologia 36: 34 (1977) and 39: 80. 1978.

This species is very closely related to and similar to L. grandiflora Mart. & Schau., with which it has been confused in some herbaria. Irwin and his associates describe L. lepida as an herb to 10 cm. tall, with red-violet corollas, and have encountered it on burned-over campos, at 900 m. altitude, flowering in August.

Additional citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 7900 (Ld, N, Z).

LIPPIA LIBERIENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 359. 1966; Moldenke, Fifth Summ. 1: 88 (1971) and 2: 892. 1971; Moldenke, Phytologia 39: 34. 1978.

Recent collectors describe this plant as a small subshrub or shrub, 0.8—2 m. tall, the leaves with a strong sweet odor when crushed, and have encountered it on grassy hillsides and in areas of savanna and scrub forest, flowering in January. The corollas are said to have been "yellow" on both collections cited below. Material has been misidentified and distributed in some herbaria as the closely related L. oxyphyllaria (Donn. Sm.) Standl. or as L. controversa Moldenke.

Additional citations: COSTA RICA: Guanacaste: Burger & Ramirez B. 4082 (N); Williams, Molina R., & Williams 26440 (N).

LIPPIA LINDMANNII Briq.

Additional bibliography: Moldenke, *Phytologia* 13: 359. 1966; Moldenke, *Fifth Summ.* 1: 156 & 183 (1971) and 2: 892. 1971; Troncoso, *Darwiniana* 18: 339 & 410. 1974; Moldenke, *Phytologia* 29: 75 (1974) and 31: 384. 1975.

LIPPIA LINDMANNII f. OPPOSITIFOLIA Moldenke, *Phytologia* 29: 75. 1974.

Bibliography: Moldenke, *Phytologia* 29: 75 (1974) and 31: 384. 1975.

Citations: BRAZIL: Mato Grosso: Irwin & Soderstrom 6616 (N—type).

LIPPIA LINEARIFOLIA Moldenke, *Phytologia* 24: 454. 1972.

Bibliography: Moldenke, *Phytologia* 24: 454 (1972) and 25: 229. 1973; Anon., *Biol. Abstr.* 55 (9): B.A.S.I.C. S.272. 1973; Hocking, *Excerpt. Bot. A.23*: 292. 1974.

Citations: BRAZIL: Minas Gerais: Hatschbach 27812 (Z—type).

LIPPIA LINEARIS H.B.K.

This taxon is now called Phyla linearis (H.B.K.) Troncoso & López-Palacios, a taxon uncomfortably close to P. stoechadifolia (L.) Small.

LIPPIA LONGEPEDUNCULATA Kuntze

Additional synonymy: Lippia longipedunculata Kuntze ex Hocking, *Excerpt. Bot. A.10*: 271. 1966.

Additional & emended bibliography: Briq. in Chod. & Hassl., *Bull. Herb. Boiss.*, ser. 2, 4: 1159. 1904; Briq. in Chod. & Hassl., *Pl. Hassler.* 2: 495. 1904; Burkart, *Excerpt. Bot. A.5*: 586. 1962; Hocking, *Excerpt. Bot. A.10*: 271. 1966; Moldenke, *Phytologia* 13: 359—360. 1966; Moldenke, *Résumé Suppl.* 16: 23. 1968; Moldenke, *Fifth Summ.* 1: 156 & 186 (1971) and 2: 552, 556, 559, & 892. 1971; Troncoso, *Darwiniana* 18: 340 & 410. 1974; Moldenke, *Phytologia* 38: 478. 1978.

Material of this species has been misidentified and distributed in some herbaria as L. angustifolia Cham.

Additional citations: PARAGUAY: Fiebrig 4083 (Mu—4129), 4773 (Mu—4131).

LIPPIA LOPEZII Moldenke

Synonymy: Lippia lopezii Mold. ex Soukup, Biota 11: 14. 1976.

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 9: 187. 1963; Moldenke, Phytologia 12: 260. 1965; Moldenke, Fifth Summ. 1: 142 (1971) and 2: 892. 1971; Soukup, Biota 11: 14. 1976; Moldenke, Phytologia 36: 44 (1977) and 39: 41. 1978.

The Segástegui, Cabanillas, & Dios 8165, distributed as L. lopezii, actually is L. ferruginea H.B.K.

LIPPIA LORENTZII Moldenke

Additional synonymy: Lippia chacensis Moldenke, Phytologia 2: 414-415. 1948. Lippia inundata Mart. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional & emended bibliography: Moldenke, Phytologia 2: 414-415. 1948; Moldenke, Lilloa 14: 41. 1948; Moldenke, Castanea 13: 117. 1948; Moldenke, Alph. List Cit. 4: 1293. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 97 & 189. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 138. 1953; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Moldenke, Résumé 114 & 461. 1959; Moldenke, Phytologia 12: 63 & 119 (1965), 13: 350 (1966), and 14: 409. 1967; Moldenke, Résumé Suppl. 15: 5. 1967; Moldenke, Fifth Summ. 1: 183, 186, 189, & 198 (1971) and 2: 554, 555, 890, & 892. 1971; Troncoso, Darwiniana 18: 338 & 410. 1974; Moldenke, Phytologia 36: 35, 36, 43, & 44 (1971), 38: 398 (1978), and 39: 31. 1978.

Recent collectors describe this plant as a decumbent, sprawling, or erect subshrub, 0.3-1.2 m. tall, and have found it growing on dunes, lake shores, riverbanks, and campos, and in dry, exposed, sunny soil along streams, at 50 m. altitude, flowering in January, April, June, and September to November, fruiting in January, April, September, and November. Rosengurt refers to it as "common in small riverside woods". The corollas are said to have been "violet" in color on Schinini 7599 and on Schinini & Cristóbal 9863, "purple" on Woolston 1263, "rose" on Rosengurt B.950, "rose-purple" on Herter 747a, "rose-lilac" on Rojas 12082, "lilac" on Meyer 10404, "pale-purple" on Herter 747, and "floras fuchsias" on Krapovickas & al. 26803.

Lippia inundata, a cheironym, was based on Martius 2738 from Roraima, Brazil, deposited in the Munich herbarium.

Most of the collections cited below were misidentified, distributed, and even previously cited by me as L. alba (Mill.) N. E. Br.; others have been distributed as L. geminata H.B.K. or L. geminata Kunth.

Additional & emended citations: BRAZIL: Roraima: Martius 2738 (Mu-40), s.n. [Rio Negro] (Mu-41). BOLIVIA: Santa Cruz: R. E. Fries 1445 (F-photo, N, N-photo, S, Si-photo, Z-photo). PARAGUAY: Hassler 11112 (Ca-930219, Go, N, S, W-1056911); Woolston 1263 (N). URUGUAY: Arechavaleta s.n. [Herb. Mus. Hist. Nat. Montev. 1132] (N); Berro 86 (N); A. L. Cabrera 2581 (N, N, N); A.

Castellanos s.n. [Bella Unión, Jan. 28, 1948; Herb. Inst. Miguel Lillo 15044] (N); Herter 747 [Herb. Herter 82833] (B, Ca—32334, N, N, S, W—1344155), 747a [Herb. Herter 82658] (N); Osorio s.n. [Bella Unión, Jan. 28, 1948; Herb. Mus. Hist. Nat. Montev. 13930] (N, Ug—13930); Rosengurt B.950 (N). ARGENTINA: Chaco: T. Rojas 12083 (N, S). Corrientes: Ibarrola 894 (Ut—3305438); Krapovickas, Cristóbal, Irogoyen, & Schinini 26803 (Ld); Schinini 7599 (Z); Schinini & Cristóbal 9863 (Ld). Entre Ríos: T. Meyer 10404 (N), 10580 (N). Formosa: I. Morel 6453 (N); Pierotti 4087 (N).

LIPPIA LUCENS Standl.

Additional bibliography: Moldenke, *Phytologia* 13: 360. 1966; Moldenke, *Résumé Suppl.* 16: 3. 1968; Gibson, *Fieldiana Bot.* 24 (9): 208 & 209. 1970; Moldenke, *Fifth Summ.* 1: 80 & 83 (1971) and 2: 892. 1971; Moldenke, *Phytologia* 39: 29 & 34. 1978.

Gibson (1970) reduces this species to synonymy under L. cardiostegia Benth. and maintains that the Molina R. 1456, 1837, & 3213, P. C. Standley 26473, and Williams & Molina R. 10802, distributed as and cited by me (1965) as L. lucens, actually represent L. oxyphyllaria (Donn. Sm.) Standl. She says: "Although the leaves of L. oxyphyllaria are bullate-rugose and sometimes glabrate and lustrous, they are usually more or less pilose; the flower-heads are much larger than those of L. cardiostegia, often 2.5 cm. wide, and in fruit 3—4 cm. long, with large bracts, sometimes as long as 1.8 cm."

The Molina R. 13054 & 13219 and P. C. Standley 13668, distributed as and in the latter case previously cited by me as L. lucens, actually are L. controversa Moldenke.

LIPPIA LUPULIFORMIS Moldenke

Additional bibliography: Dale & Greenway, *Kenya Trees* 588. 1961; Moldenke, *Phytologia* 13: 360. 1966; Moldenke, *Fifth Summ.* 1: 237, 241, 244, & 257 (1971) and 2: 559 & 892. 1971.

Additional citations: ANGOLA: Huila: R. Santos 105 (Z).

LIPPIA LUPULINA Cham.

Additional synonymy: Lippidia lupulina Cham. ex Moldenke, *Résumé Suppl.* 17: 11, in syn. 1968. Lippia latoovata Mart. ex Moldenke, *Phytologia* 36: 44, in syn. 1977.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; R. C. Foster, *Contrib. Gray Herb.* 184: 170. 1958; Burkart, *Excerpt. Bot. A.5*: 586. 1962; Eiten in Ferré, *Simpos. Sobre Cerrado* 190. 1962; Angely, *Fl. Anal. Paran.*, ed. 1, 576. 1965; Hocking, *Excerpt. Bot. A.10*: 271. 1966; Moldenke, *Phytologia* 14: 409. 1967; Moldenke, *Résumé Suppl.* 17: 11. 1968; Ferré, *Pl. Bras. Esp. Cerrado* 144 & [145], fig. 61. 1969; Goodland, *Phytologia* 20: 78. 1970; Angely, *Fl. Anal. & Fitogeogr. Est. S. Paulo*, ed. 1, 4: 835 & xi, map 1386. 1971; Moldenke, *Fifth Summ.* 1: 156, 183, 186,

& 198 (1971) and 2: 551, 553, 559, 560, 564, 568, 618, 682, & 892. 1971; Moldenke, *Phytologia* 28: 439. 1974; Troncoso, *Darwiniana* 18: 334, 339, & 410. 1974; Moldenke, *Phytologia* 36: 44 (1977) and 39: 43. 1978.

Additional illustrations: Ferré, *Pl. Bras. Esp. Cerrado* [145], fig. 61. 1969.

Recent collectors describe this apparently quite variable species as an herb, growing from a perennial woody base, or an erect few-branched or few-stemmed subshrub, 0.5--2 m. tall, xylopodiferous, viscid, brittle, the stems herbaceous, spindly, from a thick woody or tuberous base, the "roots woody", the leaves pleasantly aromatic, the inflorescences ("involucres") rose or pink, the bracts varying from light-green or lavender-green, pink, lavender-pink, rose-pink, or pale-pink to lavender, pale-lavender, lilac, purple-lilac, purple, pinkish-purple, pale-violet, or dull light-violet, very showy, "at first white", and the corollas as "tubular".

Collectors have found it growing in rocky soil, on campos, dry campos, campo slopes and outcrops, dry rocky campos with sparse shrubs, campo cerrado, cleared and well-grazed cleared cerrado, and steep hillside cerrado with pebbly clay soil, in brejo (sedge meadows) and "thin campo vegetation", along creek margins, in recently burned-over cerrado and "slight slopes near river plains", and next to grazed cerrado. The Eitens encountered it in "pastures originally cerrado, at this season thickly covered with long grass", "in natural grassy campo at head of a valley, the ground layer recently burned, the soil sandy, near border with cerrado", in "low trees and scrub woodland cerrado unburned for several years", and at the "edge of low tree and scrub woodland cerrado at its border with a natural grass campo, in light beige soil". Irwin and his associates refer to it as "occasional in cerrado and campo in an area of gallery forest and adjacent cerrado and campo", "in cerrado on upper slopes in an area of steep campo and cerrado slopes", "mostly in campo on steep slopes", and "infrequent among campo grasses". Goodland refers to it as "occasional", while Anderson and his associates encountered it "on campo in an area of cerrado and nearly open campo sloping down through brejo to gallery forest". It has recently been collected at 300--1400 m. altitude, flowering from September to May and in July, fruiting from January to March and in July and September.

The corollas are described as having been "rose" colored on Hatschbach 37095 & 38772 and Mattos & Mattos 8261, "lilac" on Eiten & Eiten 8742, Hatschbach 12998, Pabst 5999, and E. Pereira 6172, "lavender" on Irwin & Soderstrom 6192, "magenta" on Irwin & al. 26361 & 27228, "purple" on Hunt & Ramos 5687, "mauve-pink" on Hunt & Ramos 5456, "pinkish-purple" on Irwin & al. 15160, "purple, yellow in center" on Krapovickas & al. 18294, "magenta, throat paler" on Irwin & Soderstrom 6775, "pink with orange throat" on Harley 10300, "rose, whitish inside" on Hatschbach 32925, "purple-pink with yellow eye" on Anderson 8302 & 8741, "bright-magenta" on

Irwin & al. 22089, "mauve with yellow throat" on Anderson & al. 35270, "magenta, yellow in throat" on Irwin & al. 8048, "rose-pink, darkening in age" on Irwin & al. 13895, "rose-pink, tube yellow within" on Irwin & al. 20324, "rose-pink, throat yellow, becoming magenta in age" on Irwin & al. 12128, "lilac (ca. 10 P 6/6), some tubes white, then yellow" on Lindeman & Haas 2704, "light-violet, center yellow in some flowers or a darker violet in others" on Eiten & Eiten 2611, "violet-red" on Fiebrig 4095, "rose-pink, tube orange-yellow within" on Irwin & al. 6083, "rose, interior of tube yellow" on Hatschbach 18826, and "violet, beginning of tube white, then yellow" on Gottsberger 133. On other collections the colors are given as follows: "petals light-purple, throat entrance golden-yellow" (Eiten 3558), "tube white, outer flaring lip light-violet" (Eiten & Eiten 8941), "limb lilac" (Mimura 406), "tube light-violet with golden-yellow throat" (Eiten & Eiten 8539), "tube whitish, throat bright-yellow, limb bright mauve-purple" (Philcox & Ferreira 4143), "tube pink, limb purple, throat yellow" (Philcox & al. 3453), and "yellow-green" (Irwin & al. 20304). Mimura says: "erva 8 dm. alt.; eixos da face da flôr 11 x 12 mm., limbo corolíneo lilás, garganta amarela" or "brácteas lilases; tubo corolíneo externamente branco, internamente amarelo e, em sua parte superior, um anel branco, limbo lilás".

The Angely (1971) reference cited above is sometimes listed as published in "1970", the erroneous title-page date. Angely cites Wacket s.n. from São Paulo. Eiten (1962) cites his no. 3558, Eiten & Eiten 2244 & 2273, and Mattos & Mattos 8261. Troncoso (1974) cites Crovetto 8628 from Misiones, Argentina, and Pedersen 9428 from Paraguay, both deposited in the San Isidro herbarium. Martius 744, in the Munich herbarium, is the type of the cheironymous L. latcovata Mart. The Clausen collection cited below was identified at Munich as "L. lupulina var."

Material of this species has been misidentified and distributed in some herbaria as Lantana sp. On the other hand, the Martius s.n. [Serro Frio, Julio 1851], distributed as L. lupulina, actually represents L. francensis Moldenke and M. Wagner 585 is L. oxyphyllaria (Donn. Sm.) Standl.

Additional citations: BRAZIL: Distrito Federal: Hunt & Ramos 5456 (N); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 26361 (Ac); Irwin, Grear, Souza, & Reis dos Santos 13895 (Ld, N); Irwin & Soderstrom 6083 (N); Irwin, Souza, & Reis dos Santos 8048 (Ld, N), 12128 (N); A. F. Santiago 21 (Ll, N). Goiás: W. R. Anderson 8302 (Ld, N); Fonsêca 294 (N); Hatschbach 37681 (Ac), 38772 (Ld); Irwin & Soderstrom 7159 (Ac, N, N); Irwin, Souza, & Reis dos Santos 15160 (Ac, N). Mato Grosso: Eiten & Eiten 8539 (W-2757736), 8742 (W-2757740), 8941 (N, W-2757755), 8949 (W-

2757730), 9793 (Ld, W--2678785); Harley 10300 (N); Hunt & Ramos 5687 (N); Irwin & Soderstrom 6692 (N), 6775 (N); Krapovickas 14397 (Ac); Krapovickas, Cristóbal, & Ahumada 14017 (Ld, Ld); Nienstedt 166 (Ac); Philcox & Fereira 4143 (N); Philcox, Fereira, & Bertoldo 3453 (N); Ramos & Sousa R. 40 (N). Minas Gerais: W. R. Anderson 8741 (Ac, N); Anderson, Stieber, & Kirkbride 35270 (Ld, N); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27228 (Ld); Irwin, Maxwell, & Wasshausen 20304 (Ac), 20324 (Ac, N); Irwin, Reis dos Santos, Souza, & Fonsêca 22089 (Ac, N); Martius 744 (Mu--52), s.n. [in campis aridiusculis deserti Serra de S. Anto. etc. Jul.] (Mu--53). Pará: Kirkbride & Lleras 2899 (W--2826919). Paraná: Borio 5 (W--2527806); Hatschbach 12998 (W--2564172), 18826 (Ld), 25910 (Ld), 32925 (Ld), 37095 (Ld); Lindeman & Haas 2704 (N); Moreira Filho & Matoso 466 (Ws); Pabst 5999 [E. Pereira 6172; Herb. Brad. 22513] (Mu, N); Reitz & Klein 17516 (N, W--2548341). São Paulo: A. Chevalier s.n. [Campo Alto, 14 Sept. 1928] (P); G. Eiten 3558 (N, W--2523079); Eiten & Eiten 2611 (Ld, W--2745641); Goodland 39 (N); I. S. Gottsberger 133 [3] (Ld); Machado da Campos 72 (N); Martius s.n. [ad Taubaté, Decbr. 1817] (Mu--54); Mattos & Mattos 8261 (N, W--2523078); Mimura 392 (W--2555604), 106 (W--2555608), 525 (N). State undetermined: P. Clausen s.n. [Aug.-April 1840] (Mu--4311); J. E. Pohl s.n. [in Brasilia] (Mu--1098); Sidney 1085 [Onishi 316; Serra do Garcas] (Ac). PARAGUAY: Fiebrig 4095 (Mu--4130); T. Rojas 3703 [Hort. Parag. 12103] (Mu). ARGENTINA: Misiones: Krapovickas, Cristóbal, Arbo, Benitez, Maruffak, Maruffak, Pire, & Tressens 18294 (Ld, Ws).

LIPPIA LUPULINA var. ALBIFLORA Troncoso

Additional bibliography: Burkart, Excerpt. Bot. A.5: 586. 1962; Moldenke, Phytologia 12: 271. 1965; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 563 & 892. 1971.

Pedersen describes this plant as a subshrub, 30--70 cm. tall, and encountered it on loose sandy soil in rough grassland, flowering in November.

Additional citations: PARAGUAY: Pedersen 9428 (N).

LIPPIA LUPULINA var. PARAGUARIENSIS Chod.

Additional bibliography: Moldenke, Phytologia 13: 350. 1966; Moldenke, Fifth Summ. 1: 156 & 186 (1971) and 2: 564 & 892. 1971; Moldenke, Phytologia 28: 439. 1974.

Recent collectors describe this plant as an erect subshrub or shrub, 1--2.5 m. tall, with a few slender stems, the bracts rose or pale red-violet, and have encountered it in cerrado and fields, on limestone slopes, and on "campo lombo de chapada", at 700--1000 m. altitude, flowering in May and August, fruiting in August. The corollas are said to have been "red-violet" on Irwin & Soderstrom 5150, "rose-red" on Irwin & al. 7877, and "rose, tube

yellow inside" on Hatschbach 32104. Irwin and his associates refer to the plant as "common".

Additional citations: BRAZIL: Distrito Federal: Irwin & Soderstrom 5150 (Ld, N); Irwin, Souza, & Reis dos Santos 7877 (Ac, N). Mato Grosso: Hatschbach 32104 (Ld).

LIPPIA MACEDOII Moldenke

Additional bibliography: Moldenke, Phytologia 12: 272—273. 1965; G. Taylor, Ind. Kew. Suppl. 13: 81. 1966.

LIPPIA MARRUBIIFOLIA Reicherdt

Additional bibliography: Moldenke, Phytologia 13: 360. 1966; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 892. 1971.

LIPPIA MARTIANA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 469—470. 1904; Moldenke, Phytologia 13: 360—361. 1966; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 835 & xi. 1971; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 559, 560, 564, & 892. 1971.

Recent collectors describe this plant as an aromatic, malodorous shrub or subshrub, 1—3 m. tall, with small fragrant flowers, and have encountered it in forests and cerrado, among rocks at creek margins, and in gallery forest margins, at altitudes of 950—1500 m., flowering from January to March. Anderson found it growing in "red soil on grassy level campo with scattered shrubs and trees, probably recently burned", in "cerrado in area of wooded hills of blocky quartzite outcrops and sandy rocky cerrado at its base", and in "forest edge in area of gallery forest along streams and adjacent cerrado".

The corollas are said to have been "white" on Anderson 6272, 7532, & 10228, Héringer 14446, Irwin & al. 12445, 13079, & 13726, and Murça Pires 57903.

Peckolt (1904) records the species from Minas Gerais and São Paulo and reports the vernacular name, "herva de velludo", which he translates as "Samtkraut, aufolge der samtartigen Bekleidung der ganzen Pflanze". The Angely (1971) reference listed in the bibliography above bears the incorrect title-page date of "1970".

Additional citations: BRAZIL: Distrito Federal: Héringer 14446 (N); Irwin, Grear, Souza, & Reis dos Santos 13079 (N, Z); L. B. Smith 15076 (N). Goiás: W. R. Anderson 6272 (Ld, N), 7532 (Gz, N), 10228 (Ac, N); Irwin, Grear, Souza, & Reis dos Santos 12445 (Ac, N), 13726 (Ld, N); Murça Pires 57903 (N, W—2571106A). Minas Gerais: P. Clausen 140 [Herb. Martius 1028; Macbride photos 7859] (E—116718—cotype, Mu—64—cotype, Mu—1200—cotype); Regnell 1.333 [1848] (Mu—1486—cotype, Z—cotype).

LIPPIA MATTOGROSSENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 361. 1966;

Moldenke, Fifth Summ. 1: 156 (1971) and 2: 892. 1971; Moldenke, Phytologia 36: 35. 1977.

Recent collectors refer to this plant as a shrub, 2 m. tall, and have found it growing in forests, cerrado, and "cerrado being transformed into pasture", flowering from January to March and in May, fruiting in January and March. The corollas are said to have been "whitish" on Hatschbach 31869 and on Hatschbach & Ramamoorthy 38210 and "white with yellow throat" on Philcox & Ferreira 4380.

Material of this species has been misidentified and distributed in some herbaria as L. sidoides Cham. On the other hand, the Anderson 9857, Irwin, Souza, Grear, & Reis dos Santos 16787, 16799, 17341, & 17457, Philcox & Freeman 4736, Ratter, Bertoldo, Castro, Santos, & Souza R.904, and Ratter, Santos, Souza, & Ferreira R. 1357, distributed as L. mattogrossensis, actually are L. obscura Briq., a closely allied species with the pubescence on the branches and twigs antrorsely appressed (not spreading-hirsute as in L. mattogrossensis).

Additional citations: BRAZIL: Goiás: Hatschbach & Ramamoorthy 38210 (Ld). Mato Grosso: Philcox & Ferreira 4380 (N).

LIPPIA MCVAUGHII Moldenke

Synonymy: Lippia mcvaughii Moldenke apud G. Taylor, Ind. Kew. Suppl. 8: 388. 1962.

Additional bibliography: G. Taylor, Ind. Kew. Suppl. 8: 388. 1962; Moldenke, Phytologia 12: 277. 1965; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 892. 1971; Moldenke, Phytologia 23: 414 (1972) and 36: 44. 1977.

McVaugh describes this plant as a tree or "shrubby, tree-like", 2--8 m. tall, the trunk to 15 cm. in diameter, with pale longitudinally stripping bark, the inflorescences greenish-white, and the bracts "pale greenish-white or purplish" or "nearly white, then greenish to tan", and encountered it as "occasional in stream valley with Hura and other tall trees in precipitous eroded granitic sands", "abundant in thorn forest with Caesalpinia, Guaiacum, Cephalocereus, and Jatropha", and "very abundant, becoming weedy, on wooded hills and bluffs with arborescent Ipomoea, Cordia, Caesalpinia, Jatropha, and Bursera", at altitudes of 30--250 m., flowering in December. The corollas are said to have been "cream-color" on his no. 25453.

Additional citations: MEXICO: Colima: McVaugh & Koelz 1660 (Autotype, N--isotype). Jalisco: R. McVaugh 25335 (Mi), 25453 (Mi), 26300 (Mi).

LIPPIA MELASTOMIFOLIA Gandoger

Additional bibliography: Moldenke, Phytologia 12: 278 & 301. 1965; Moldenke, Fifth Summ. 1: 80 (1971) and 2: 892. 1971.

LIPPIA MICHOCANA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.11: 505. 1967; Moldenke, Phytologia 14: 409. 1967; Moldenke, Biol. Abstr. 49: 2769. 1968; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 892. 1971; Heslop-Harrison, Ind. Kew. Suppl. 15: 80. 1974.

Additional citations: MEXICO: Michoacán: R. McVaugh 22869 (Ip--isotype).

LIPPIA MICROCEPHALA Cham.

Additional synonymy: Lippia miocephala Harley & Kunitomo ex E. M. D., Biol. Abstr. 51: 1076. 1970. Lippia macrocalyx Mart. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 470--471. 1904; Moldenke, Phytologia 14: 409. 1967; Harley & Kunitomo, Bull. Entomol. Res. 58: 787--792. 1969; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 556, 560, 567, 568, & 982. 1971; Moldenke, Phytologia 36: 44. 1977.

Recent collectors describe this plant as a slightly viscous and ramose subshrub, 0.8--2.5 m. tall, rigid and brittle, the floral buds white, and have found it growing in cerrado on rocky slopes and with campo on steep hillsides, at altitudes of 1100--1750 m., flowering from January to May and in July, fruiting in January and February. Irwin and his associates encountered it "in cerrado in an area of gallery forest and adjacent cerrado and campo" and "mostly restricted to soil-filled crevices on steep rocky slopes", also "frequent on steep rocky slopes in 'canga' soil", "on lower slopes in cerrado on steep schist slopes", "in disturbed places especially around outcrops in wooded valley", and "on hills with iron-rich 'canga' soil". Anderson and his associates found it "at edge of gallery forest, adjacent sedge meadow, and 'campo sujo', with rocky campo on higher drier slopes" and "in campo in areas of gallery forest and adjoining 'campo sujo'". Davidse and Ramamoorthy encountered it "in cerrado on hillside with gravelly red soil". A vernacular name reported for it is "alacrín".

The corollas are described as having been "rose" colored on Hatschbach 36438 and Hatschbach & al. 29027, "lilac" on Hatschbach & Ahumada 31662, "lilac-pink" on Mexia 5710, "cream to lavender" on Irwin & al. 19813, "white, rose inside" on Emygdio & al. 3261, "white, lavender-pink in throat" on Irwin & al. 29348, "white, pale-pink in throat" on Irwin & al. 29676, "pale-pink, the tube red-violet within" on Irwin & al. 29164, "pale-pink, white in age" on Irwin & al. 28309, "pale-pink, darker in throat" on Irwin & al. 22071, "white, pink in age" on Anderson 8436, "pink, aging to cream" on Irwin & al. 2897, "pale-lavender, aging to white" on Irwin & al. 22680, "white with a yellow eye & tube when young, later white with a purple eye & tube" on Anderson & al. 35173, and "reddish-purple with a white margin" on Davidse & Ramamoorthy

10801.

Martius' cheironymous name, L. macrocalyx, is based on the un-numbered Martius collection from "in alpinis ad V. R., April", cited below, and deposited in the Munich herbarium.

Harley & Kunimoto (1969) found the beetle, Plagiohammus spinipennis, on Lippia microcephala as host. Peckolt (1904) reports the plant from Minas Gerais and Rio de Janeiro and the vernacular names, "chá de frade do mato" [which he translates as "wilder Mönchstee"], "hyssopó do terra" ["einheimischer Ysop"], and "alecrim do serra" ["Gebirgsrasmarin"]. He says that the plant is a "Strauch mit elliptischen, an der Basis keilförmigen, gesägten, Blätter. Blüten weiss mit gelbem Schlund in drei- bis fünfblütigen Köpfchen. Die Pflanze ist in allen Teilen reich an Harz, brennt ähnlich einer Fackel, in Bündeln gebunden dient sie zu diesem Zwecke sowie zur Räucherung. Die Blätter riechen, nur wenn gerieben, ähnlich einer Mischung von Rosmarin und Thymian. Bei im Handel befindlichen luftgetrockneten Blätter liefern 20 Kg nur 1,2 g hellgelbes ätherisches Öl". He further lists a number of other chemical compound constituents.

Additional citations: BRAZIL: Minas Gerais: W. R. Anderson 8436 (Ld, N); Anderson, Stieber, & Kirkbride 35173 (Ld, N, W—2709292); Davidse & Ramamoorthy 10801 (Ld, N); Emygdio, Duarte, Becker, & Silva Santos 3261 (N); Hatschbach & Ahumada 31662 (Ac, Ld, W—2706095); Hatschbach, Anderson, Barneby, & Gates 36438 (Ld, N); Hatschbach, Smith, & Ayensu 29027 (Ld, W—2744551); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28309 (Ld); Irwin, Harley, & Onishi 28971 (Ld, N, W—2755321), 29164 (Ac, N, W—2759078), 29348 (Ld, N, W—2759074), 29676 (N, W—2758980, Ws); Irwin, Maxwell, & Wasshausen 19813 (Ld, N); Irwin, Reis dos Santos, Souza, & Fonsêca 22071 (Ac, N), 22680 (Ld, N); Martius 814 (Mu—66), 1038 (Mu—67, Mu—1202), s.n. [in apricis montanis virgulosus, 1818] (Mu—65), s.n. [in alpinis ad V. R., April] (Mu—50); Mexia 5710 (Au—121211, Ba); Murça Pires 57932 (Ld, N, N, N, W—2758984); Princess Therese of Bavaria s.n. [Itacolumy, VIII.1888] (Mu). State undetermined: Herb. Zuccarini s.n. [e Brasilia] (Mu—68). MOUNTED ILLUSTRATIONS: Mart., Fl. Bras. 9: pl. 38 II. 1851 (N, 2).

LIPPIA MICROMERA Schau.

Additional bibliography: Schau., Linnaea 20: 480. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Pompa, Colecc. Medicament. Indig., ed. 5. 1875; Pittier, Man. Pl. Usual. Venez. 314 & 435. 1926; V. E. Graham, Trop. Wild Fls. 110—112. 1963; Liogier, Rhodora 67: 349. 1965; Hocking, Excerpt. Bot. A.10: 271. 1966; Moldenke, Phytologia 14: 410. 1967; Moldenke, Biol. Abstr. 50: 7999. 1969; Moldenke, Phytologia 18: 210—211. 1969; Oberwinkler, Pterid. & Sperm. Venez. 18 & 78. 1970; Hartwell, Lloydia 34: 386. 1971; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1:

86, 97, 103, 105, 112, 113, 117, 124, 130, 156, & 366 (1971) and 2: 519, 553, 556, 559, 562, 892, & 893. 1971; Alemán Frías, Aurich, Ezcurra Ferrer, Gutiérrez Vázquez, Horstmann, López Rendueles, Rodríguez Graquitená, Roquel Casabella, & Schreiber, Die Kulturpfl. 19: 422. 1972; Farnsworth, Pharmacog. Titles 7 (4): xvii & 222. 1972; Moldenke, Phytologia 23: 417. 1972; Farnsworth, Pharmacog. Titles 8 (8): xiii. 1973; León & Alain, Fl. Cuba, imp. 2, 2: 288 & 289. 1974; Moldenke, Phytologia 28: 436. 1974; [Farnsworth], Pharmacog. Titles 7, Cum. Ind. [72]. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 60. 1975; Moldenke, Phytologia 34: 274. 1976.

Additional illustrations: V. E. Graham, Trop. Wild Fls. 111. 1963.

Recent collectors describe this plant as a large shrub or subshrub, 0.4—4 m. tall, woody, erect, unarmed, much-branched, strongly and penetratingly aromatic, often gregarious; stems brown, with white hairs; young twigs tetragonal; leaves dark-green above, lighter beneath with white hairs, fragrant with a strong odor of oregano when crushed; flowers axillary; sepals green, with whitish hairs; anthers yellow; stigmas cream; style pink. Ruiz-Terán & López-Palacios say: "Ramitas....pardas....adultas subcilíndricas, marrones, fisuradas. Hojas simples, opositidecussadas, prolíficas en las axillas, verde intensas por la haz, más claras, por el envés. Cimas capituloides pedunculadas, axilares. Cáliz verde intenso, con ápice de los segmentos purpúreo."

Collectors have found this plant growing on arid slopes, at altitudes of 900—2650 m., flowering from December to April, as well as in June, September, and December. The corollas are said to have been "white" on Bianco 100, López-Palacios 2724, Nevling 265, Pittier 13108, and Ruiz-Terán & López-Palacios 7592 & 8796, "white with a blotch of yellow in the center" on Omamale & Persaud 154, "white or lilac-white, the throat light orange-yellow" on Ruiz-Terán & López-Palacios 9691, "blanca, salvo la garganta, amarillo verdosa" on Ruiz-Terán & López-Palacios 7592, and "verbenacea blanca, con garganta y anteras amarillo limon" on Ruiz-Terán & López-Figueiras 1797.

Omawale & Persaud report this species cultivated in vegetable gardens in Guyana. Hartwell (1971) says that in Venezuela it is used in native medicine mixed with vinegar and salt to treat "cold tumors". Ruiz-Terán & López-Palacios assert that it is "usada localmente para condimentar carne de cochino". López-Palacios (1975) reports that in Venezuela it is an "Arbustico muy aromático, ampliamente distribuido en el territorio nacional, usado principalmente como condimento por su olor a orégano, nombre con el que es vulgarmente conocido. Para Venezuela no ofrece dificultad." Neal reports that it is used to flavor soups and meatloaf in Hawaii. Graham (1963) says: "Small Thyme...is a small shrub grown in many parts of the tropics as a herb for flavouring. It has close clusters of white flowers in the leaf axils."

Common and vernacular names recently reported for this plant are "false thyme", "fineleaf thyme", "orégano", "small thyme", and "Spanish thyme".

All the collections from Puerto Rico and Hispaniola distributed as typical L. micromera are probably better regarded as var. helleri (Britton) Moldenke.

Additional citations: TRINIDAD AND TOBAGO: Trinidad: Sieber Fl. Trinit. 86 (Mu—1202). COLOMBIA: Norte de Santander: Garganta 1126 (W—2771840). VENEZUELA: Aragua: Vogl 1348 (Mu). Delta Amacuro: Ruiz-Terán & López-Palacios 9691 (Gz). Lara: Pittier 13108 (E—953591, Mu); Saer d'Héguert 484 (Mu). Mérida: López-Palacios 2724 (N, Z); Ruiz-Terán & López-Figueiras 1797 (N), 8796 (Ac). Táchira: Aristeguieta 2117 (N). Trujillo: Ruiz-Terán & López-Palacios 7592 (Ld). CULTIVATED: Guyana: Omawale & Persaud 154 (N). Hawaiian Islands: Neal 1235 (Ba). Jamaica: Nevling 265 (Ba). Venezuela: Bianco 100 (N); Oberwinkler & Oberwinkler 13405 (Mu).

LIPPIA MICROMERA var. **HELLERI** (Britton) Moldenke

Additional synonymy: Lantana floribunda Urb. & Ekm. ex Moldenke, Phytologia 34: 274, in syn. 1976. Lantana micromera Schau., in herb.

Additional & emended bibliography: Sessé & Moc., Fl. Mex., ed. 2, 139—140. 1894; Arrillaga, Puerto Rico Agr. Exp. Sta. Ann. Rep. 28—29. 1939; Anon., Chem. Abstr. 36: 5614 (1942) and 37: 1225. 1943; Arrillaga, Am. Perfumer 45: 27—29. 1943; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Moldenke, Phytologia 14: 410. 1967; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 265. 1969; Moldenke, Fifth Summ. 1: 86, 97, 103, 105, & 336 (1971) and 2: 553, 556, & 893. 1971; Alemán Frías, Aurich, Ezcurra Ferrer, Gutiérrez Vázquez, Horstmann, López Rendueles, Rodríguez Graquitená, Roquel Casabella, & Schreiber, Die Kulturpfl. 19: 422. 1972; Farnsworth, Pharmacog. Titles 8 (8): xiii. 1973; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 668. 1973; León & Alain, Fl. Cuba, imp. 2, 2: 288 & 289. 1974; Moldenke, Phytologia 34: 274. 1976.

Recent collectors describe this plant as a small or low shrub or bush, 0.4—1.2 m. tall, the branches slender, spreading from the base, and the leaves very aromatic. They have found it growing on cliffs, elevated coral reefs, in pastures, on coastal mountains and plateaus, in arid zone thickets, and on sandy hills, in thickets along roadsides, dry thickets on rocky coasts, and thorny thickets on limestone hills and terraces, seeming to prefer limestone soil, at altitudes of sealevel to 500 meters, flowering from January to July and in September and October, fruiting in January, February, April, May, July, and September. Liogier refers to it as "quite common in thickets on hillsides".

The corollas are said to have been "white" on Allard 14432, Howard & Howard 9573, Jiménez 1025, Leonard & Leonard 11872, 11929,

11968, 12580, & 13344, and Liogier 11587a, 12677, 13641b, 15605, & 21626 and "pale-violet to whitish" on Liogier 11442. The vernacular name, "orégano", is recorded for it. J. D. Smith notes on a sheet of Eggers 1275 in the United States National Herbarium that the "connective of upper two stamens [is] produced into a clavate appendage: a character not attributed to this genus".

León & Alain (1974) state that the plant occurs on "costas y lomas" in Oriente, Cuba, as well as in the "Antillas". Sessé & Moçino (1894) say "Habitat in praedito de Josefo Garcia juxta iter de Toa Alta ad Saibanito interjectum, ubi vulgo Oregano audit....Folia et flores fragrantissimi et pro Origano in condimentis usui sunt. Floret Maio." Arrillaga (1939) reports also the name, "marjorana", and the presence of "Phenols, no aldehydes or ketones, and carvacrol in volatile oil". Ekman reports the plant "cultivated and escaped" in the Dominican Republic.

Material has been distributed in some herbaria under the name, L. micromeria Schau.

Additional citations: CUBA: Oriente: Hioram 6733 (W--2289965). HISPANIOLA: Dominican Republic: Ekman H.12451 (Ld, Ld, W--1711438); Fuertes 855 (Mu--14241, Mu, W--698007); Howard & Howard 9573 (W--2111035); Liogier 11442 (Ld, N, N, N, N), 11587a (Ac, N), 12677 (Ld, N, N, N), 13641 (W--2576809A), 13641b (Ld, N), 15605 (Ac, N, W--2576968A). Haiti: Ekman H.3619 (Ld, W--1410520); Leonard & Leonard 11872 (W--1450743), 11929 (W--1450793), 11968 (W--1450825), 12009 (W--1450862), 12113 (W--1450962), 12580 (W--1451327), 13344 (W--1452010). PUERTO RICO: Britton & Cowell 890 (W--655950); Eggers 1275 (W--1322938); F. H. Sargent 211 (W--1714654); Sintenis 6361 (W--403757); J. A. Stevenson 3933 (W--1475063). CULTIVATED: Dominican Republic: Allard 13636 (W--1956821), 14432 (W--1958345); J. de J. Jiménez 1025 (W--1882522); Liogier 21626 (N); Valeur 147 (W--1414623). LOCALITY OF COLLECTION UNDETERMINED: Herb. Schreber s.n. [West Indies] (Mu--602).

LIPPIA MICROMERA var. PALUDICOLA Moldenke

This taxon is now reduced to the synonymy of L. thymoides Mart. & Schau.

LIPPIA MICROPHYLLA Cham.

Additional synonymy: Lantana microphylla Friese, Bol. Agricult. São Paulo 34: 261. 1933. Lantana microphylla Mart. ex Braga, Fl. Nordest., ed. 2, 17. 1960 [not Lantana microphylla Franchet, 1882, nor Hutch. & Bruce, 1949, nor Mart., 1894, nor Peter, 1959]. Lantana microphylla "Mart. ex Uphof" apud Moldenke, Fifth Summ. 2: 541, in syn. 1971.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Friese, Bol. Agricult. São Paulo 34: 261. 1933; Braga, Fl. Nordest., ed. 2, 17. 1960; Moldenke, Phytologia 14: 410 & 417 (1967) and 15: 464 & 465. 1968; Uphof, Dict. Econ. Pl., ed. 2, 301.

1968; Moldenke, Fifth Summ. 1: 130 & 156 (1971) and 2: 541, 559, 560, & 893. 1971; Moldenke, Phytologia 31: 402 (1975) and 39: 78. 1978.

Braga (1960) describes this plant as an "Arbusto ou subarbusto escandente. Fôlhas opostas, simples, miúdas, mais ou menos pilosas, um tanto claras. Flores pequenas, reunidas em espigas. Drupa 2-locular. Parecido com o Alecrim, porém de fôlhas menos aromáticas, gozando, entretanto, das suas propriedades. Flores mucilaginosas, expectorantes. Do Ceará ao Paraná, Alecrim Bravo, da Bahia e em São Paulo. Com o nome de Alecrim do Campo se conhece no Piauí a Acantáceas — Rhytiglossa leucophoea Nees."

Recent collectors describe Lippia microphylla as a slender brittle shrub or subshrub, 0.2—2 m. tall, the inflorescences nodding, the floral bracts pale-green or pale yellow-green, and have found it growing in cerrado, sandy cerrado with some rocky areas, and on sand in low woodlands, as well as on sandstone hills with dry grassland among rock and woodland along small streams, at altitudes of 220—1150 meters, flowering in January, February, April, June, and July, fruiting in June. The Eitens encountered it "on flat ridge tops with open tree canopy and lots of tall Mimosa shrubs, the soil with a few or no stones". The Gottsbergers found it on "campo serrado é um campo com elementos arbóreos de cerrado esparsos", while Hatschbach encountered it on "afloramentos rochosos".

The corollas are said to have been "white" on Anderson 9085, Castellanos 25356, Eiten & Eiten 10807, Harley & al. 15682, and Irwin & al. 14786, 14925, & 17778, "whitish" on Hatschbach 34749, "cream" on Irwin & al. 32442, "white, yellow in the interior" on Gottsberger & Gottsberger 13-24771, and "white, yellow in throat" on Cooper 244.

Uphof (1968) says that it is a "Shrub. S. America. Leaves are used in some parts of Brazil as aromatic and anti-rheumatic. Fruits are a tonic and stimulant."

The Eiten & Eiten 1492 & 10807, G. Gardner 4332, and Irwin, Grear, Souza, & Reis dos Santos 14786 & 14925, distributed (and the first-mentioned previously cited by me) as L. microphylla, seem actually to represent the very closely related L. gracilis Schau. instead.

Additional citations: GUYANA: A. Cooper 244 (Ut—328762B). BRAZIL: Bahia: Gottsberger & Gottsberger 13-24771 (Ld); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15682 (K); Irwin, Harley, & Smith 32443 (Ld, N). Goiás: Hatschbach 34749 (Ld); Irwin, Souza, Grear, & Reis dos Santos 1778 (Ac, N). Maranhão: A. Castellanos 25356 [Herb. Cent. Pesq. Florest. 4125] (Fe). Minas Gerais: W. R. Anderson 9085 (Ld, N).

LIPPIA MODESTA Briq.

Additional bibliography: Hocking A.5: 586 (1962) and A.10: 271. 1966; Moldenke, Phytologia 14: 410. 1967; Moldenke, Résumé

Suppl. 15: 5. 1967; Moldenke, Fifth Summ. 1: 186, 189, & 198 (1971) and 2: 893. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

Troncoso (1974) lists this species from Argentina (Jujuy & Salta) and Paraguay. Woolston describes it as a decumbent herb, 15–20 cm. tall, with "yellow and orange flowers" [corollas], and encountered it on low campos, flowering in December. Krapovickas and his associates describe the corollas as "yellow" and collected the plant in anthesis in January.

Additional citations: PARAGUAY: Krapovickas, Cristóbal, & Palacios 12251 (W—2481387); Woolston 413 (N).

LIPPIA MORONGII Kuntze

Additional bibliography: Moldenke, Phytologia 14: 410 & 418. 1967; Moldenke, Fifth Summ. 1: 156, 186, 189, & 198 (1971) and 2: 550, 560, & 893. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974; Moldenke, Phytologia 34: 258 (1976) and 38: 479. 1978.

Hatschbach encountered this plant on dry campos, flowering in October, and reports the corollas "yellow". Troncoso records it from Argentina (Chaco), Paraguay, and Uruguay.

The Sehnem 3604, distributed as L. morongii, seems better regarded as representing L. asperima Cham., while Lourteig 1909 is L. turnerifolia Cham.

Additional citations: BRAZIL: Paraná: Hatschbach 35204 (Ld). URUGUAY: Herter 989 [Herb. Herter 82594] (Mu).

LIPPIA MULTIFLORA Moldenke

Additional & emended bibliography: Meikle in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 432, 436, & 437, fig. 306. 1963; Meikle in Brenan & al., Kew Bull. 17: 173. 1963; Trease & Evans, Textb. Pharmacog., ed. 9, 799. 1966; Moldenke, Phytologia 14: 410–412, 415, & 416. 1967; Moldenke, Résumé Suppl. 15: 5–7. 1967; Moldenke, Fifth Summ. 1: 209, 211, 217–222, 224–227, 230, & 366 (1971) and 2: 893. 1971; Drar, Publ. Cairo Univ. Herb. 3: 110. 1970; Letouzey, Man. Bot. Forest. Afr. Trop. 2 (B): 361 & 363. 1972; Moldenke, Phytologia 23: 420. 1972; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 668–669. 1973; Moldenke, Phytologia 28: 441. 1974; Jaeger & Moldenke, Phytologia 30: 387 & 401–402. 1975; Moldenke, Phytologia 38: 266 (1978) and 39: 31. 1978.

Additional illustrations: Letouzey, Man. Bot. Forest. Afr. Trop. 2 (B): 363. 1972.

Recent collectors refer to this plant as an aromatic herb, shrub, or undershrub, with an erect, grooved, light-green stem, 1.2–3 m. tall, woody at the base, the bark grayish-brown, the leaves stiff, papery, dark-green and more or less shiny above, dull and slightly paler green beneath, and fragrant flowers. They have found it growing on plains, low-lying land, in rocky soil, and on savannas grazed by cattle, at 650 m. altitude, flowering in January, February, October, and December, fruiting in January. The corollas are said to have been "white" on Lowe 1668, "white with yellow center" on the Morton collections cited below, "white, yellow in throat" on Breteler 826, and "white,

yellow in center, anthers yellow" on Breteler 574.

Jaeger & Moldenke (1975) report that L. multiflora is "Abondant en savane guinéenne....avec Lophira lanceolata, Ficus glumosa, Syzygium guineense var. macrocarpa, Entada abyssinica, Piliostigma thonningii, Bridelia ferruginea, Hymenocardia acida, Crossopteryx febrifuga, Chasmopodium caudatum, Loudetia sp., Andropogon sp., Lactuca capensis, Elephantopus mollis, Borreria ramisparsa, Laggera alata.....Terminalia glaucescens, Cussonia barteri, Markhamia tomentosa, Kotschya lutea." They describe the plant as an "Herbe érigée 2—3 m. de haut, à base ligneuse, tige anguleuse, striée, ramifiée vers le haut, glabre faiblement pubescente. Feuilles opposées, souvent verticillées par trois. Face supérieure avec nombreux poils tecteurs couchés, face inférieure glanduleuse. Inflorescences en épis terminaux ombelliformes globuleuses ou étirées cylindriques; bractées obtuses, courtement mucronées. Corolle blanc-crème, ne dépassant pas les bractées; fleurs légèrement odorantes....La plante n'est pas touchée par le bétail. Distrib. - Savanes de l'Afrique tropicale." They cite Jaeger 3955 & 6831 from Sierra Leone.

Trease & Evans (1966) report the presence of a volatile oil containing camphor in material of L. multiflora secured from Ghana. Meikle (1963) distinguishes this species from closely related species in western tropical Africa as follows:

1. Flower-heads in spreading, much-branched corymbose cymes.

2. Upper surface of leaves smooth to touch, venation obscure; stems subglabrous or sparsely appressed-pubescent; apex of floral bracts very obtuse, shortly mucronate.....

L. multiflora.

2. Upper surface of leaves rough to touch, venation prominently rugose-reticulate; stems usually distinctly appressed-pubescent; apex of floral bracts acute or cuspidate.....

L. rugosa.

1a. Flower-heads in narrow, elongate, terminal and axillary verticels or spikes.

3. Floral bracts obtuse or shortly cuspidate; leaves smooth or slightly scabridulous; stems subglabrous or sparsely appressed-pubescent.....L. chevalieri.

3a. Floral bracts acute; leaves strongly scabrid; stems densely pubescent or pilose.....L. savoryi.

Material of L. multiflora has been misidentified and distributed in some herbaria under the names, L. abyssinica (Otto & Dietr.) Cuf., L. adoensis Hochst., and L. radula J. G. Baker.

Additional citations: SUDAN: Bahr-el-Ghazal: Drar & Mahdi 1215 (Gz); Kassas, Khalifa, & Mobarak 128 (Gz), 129 (Gz, Gz), 177 (Gz). SIERRA LEONE: Jaeger 3955 (Z), 6831 (Ld). GHANA: J. K. Morton GC.9911 (Ba), s.n. [18/10/1953] (Ba). NIGERIA: Gbile & Olorunfemi F.H.I.20475 (N); Lowe 1668 (Mu). CAMEROONS: Breteler 574 (Mu), 826 (Mu); Breteler, Wilde, & Leeuwenberg 2563 (Mu).

LIPPIA MYRIOCEPHALA Schlecht. & Cham.

Additional & emended synonymy: Lippia myriocephala Cham. & Schlecht. ex Benth., Bot. Voy. Sulphur 154. 1846. Lipia myriocephala Ch. & Sch. ex Moldenke, Phytologia 28: 459, in syn. 1974. Lippia myriocephala H.B.K. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional bibliography: Hook. & Arn., Bot. Beech. Voy. 305. 1838; Schau., Linnaea 20: 479. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Kern, Mycologia 3: 289. 1911; Arthur, Mycologia 10: 51 & 133--134. 1918; Cummins, Lloydia 3: 16, 21, & 62. 1940; Hocking, Excerpt. Bot. A.10: 271. 1966; Moldenke, Phytologia 12: 362. 1966; J. Rzedowski, Act. Cienc. Potos. 6: 26, 27, 40, 41, & 47. 1966; Moldenke, Résumé Suppl. 16: 3. 1968; A. L. Moldenke, Phytologia 18: 122--124. 1969; Gibson, Fieldiana Bot. 24 (9): 208 & 211--212. 1970; Lowdon, Taxon 19: 21. 1970; Moldenke, Fifth Summ. 1: 72, 80, 83, 85, 86, & 88 (1971) and 2: 558, 560, & 893. 1971; Rouleau, Taxon Index Vols. 1-20, part 1: 216. 1972; Moldenke, Phytologia 27: 66 & 289 (1973) and 28: 431--433, 454, 459, & 460. 1974; Farnsworth, Pharmacog. Titles 9 (3): xii. 1974; Moldenke, Biol. Abstr. 57: 3780 (1974) and 58: 684. 1974; Troncoso, Darwiniana 18: 336 & 410. 1974; Hocking, Excerpt. Bot. A. 26: 5. 1975; Moldenke, Phytologia 31: 378. 1975; Molina R., Ceiba 19: 96. 1975; Moldenke, Phytologia 34: 253 (1976), 36: 30 & 44 (1977), and 39: 27, 29, 36, & 87. 1978.

Recent collectors describe this plant as a weak shrub, tree-like, or a weak tree, 2--10 m. tall, the inflorescence cream-color, and have found it growing in moist thickets and second-growth forests, montane cloud forests, and roadside thickets, on steep mountainsides and barrancas, in fir forests with Pinus, Quercus, Ostrya, Cornus, Meliosma, and Podocarpus, in open forests, moist cloud forests, mixed dense and wet cloud forests, and at the edges of mixed forests, as well as in oak forests on rocky hillsides and with many shrub composites, mosses, and ferns, at 300--2700 meters altitude, flowering from September to March and in July, fruiting from September to November. The Roes found it in a dense moist forest with palmettos, Cycas, and many shrub Compositae in the understory in the tropical vegetation zone. Breedlove encountered it on steep slopes with Pinus, Quercus, Hauya, Erythrina, Lysiloma, Oreopanax, and Ostrya adjacent to a waterfall. González & Pérez report it from the "Asociación secundaria de 5 años, con Guazuma ulmifolia, Bauhinia divaricata, Pithecellobium lanceolatum y Calliandra houstoniana. Suelo de color obscuro en el horiz. 'A' y gris en el 'B', textura arcillosa y bastante pesado".

The corollas are said to have been "yellow" on McVaugh 21511 and Williams & al. 27127, "yellowish" on Williams & al. 43204, "white with yellow center" on Roe & Roe 2330 & 2362, "cream and yellow" on Breedlove 23258, "cream" on Molina 13556 & 16942, and "greenish" on Williams & al. 20107. [to be continued]

BOOK REVIEWS

Alma L. Moldenke

"THE PLANET THAT WASN'T" by Isaac Asimov, x & 206 pp., Doubleday & Company, Inc., Garden City, N. Y. 11530 and New York, N. Y. 1976. \$7.95.

This is the well-known author's twelfth book of his essays culled from "The Magazine of Fantasy and Science Fiction". Its title is that of the first essay about Vulcan that acquired and lost orbit, size, weight and existence. Many topics are considered in the other essays, such as: the Christmas Star, UFOs, astrology, chemistry, religion and mythology.

Fascinating reading, indeed!

"OMEGA — Murder of the Ecosystem and Suicide of Man" edited by Paul K. Anderson, xiii & 447 pp. & 17 figs., 21 tab. & 34 plates as b/w illus., William C. Brown Company Publishers, Dubuque, Iowa 52001. 1971. \$5.95 paperbound.

Prepared in "the hope that things aren't as bad as they seem", this collection of 50 papers, written by as many authors and previously printed in a variety of journals, makes suitable reading for biology, environmental science and ecology classes in high schools, junior and regular colleges and adult education groups. It is certainly convenient to have them all between the covers of this one book.

"THE COMING DARK AGE" by Roberto Vacca, translated from the Italian by J. S. Whale, vi & 221 pp., Doubleday & Company, Inc., Garden City, N. Y. 11530. 1973. \$6.95.

This book analyzes "one type of catastrophe that could come about through the breakdown of the great systems that are now becoming so extremely complicated.....[that] they are now reaching critical dimensions of instability....in systems for the production and distribution of power, for transportation, communication, water supply, disposal of waste, and the processing of information". This is nightmare material realistically presented with brief alternatives.

"THE VASCULAR PLANTS OF SOUTH DAKOTA" by Theodore Van Bruggen, xxvi & 538 pp., 4 b/w map illus., Iowa State University Press, Ames, Iowa 50010. 1976. \$7.95 paperbound.

Now professors and teachers in this state's universities, colleges and other advanced schools, as well as interested amateurs and visiting botanists, can use this well prepared manual which is more up-to-date than Rydberg's classic works and Over's checklist. The keys seem to work efficiently. There is a helpful glossary. Pertinent bibliographic material is provided. The maps show (1) counties, (2) glaciations of the eastern half of the state, (3) geological formations from Precambrian through the various Pleistocene deposits, and (4) physiographic features of the eastern central lowlands and the western Great Plains of varying altitudes up to the Black Hills. There is a short treatment of the floristic elements and vegetation of these areas for the 1585 species in 115 families.

H. N. Moldenke's recent "Fifth Summary" and its supplements records Verbena ambrosifolia from Washabaugh County, V. ciliata from Hughes County, V. stricta f. albiflora from Roberts and Stanley Counties, and V. urticifolia var. leiocarpa from Bennett, Clay, Minnehaha, Roberts, and Shannon Counties. The V. hastata of South Dakota is mostly (if not all) var. scabra.

This is a valuable and useful contribution to botanical literature.

"MAGNIFICATIONS: Photography with the Scanning Electron Microscope" by David Scharf, viii & 119 pp., 5 b/w diagrams & 100 S E M plates. 1977. Schocken Books, Inc., New York, N. Y. 10016. \$24.95.

"The primary purpose of this book is to provide a visual experience of this new imagery.....of the original virgin surfaces of the living state of matter,.....without freezing, drying, fixing, staining or conductive coatings". The author gives a brief account of how S E M works: "A Journey into Micro-Space" is a fascinating introductory chapter that permits the reader to follow Scharf as he prepares material to be viewed and photographed, such as two aphids on a lemon leaf (83x) and then the sensors on one of their antennae (3,650x).

This book should have broad esthetic appeal. Students beginning to use optical microscopes could be thrilled to see the next step beyond light limitations through the simple explanations and the impressive illustrative plates of this book.

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MISCELLANEOUS SPECIES OF *MASDEVALLIA* (ORCHIDACEAE)
FROM ECUADOR, PERU AND BOLIVIA

Carlyle A. Luer*

Masdevallia albicans Luer, sp. nov.

Species haec *M. simulatricis* Krzl. affinis sed foliis angustissimis, pedunculo quam foliis semilongo, sepalis lateralibus erosis longicaudatis et lamina labelli anguste elliptica notabilis.

Plant small, epiphytic, caespitose; roots thick, flexuous. Secondary stems abbreviated, 6-10 mm long, with 2-3 close, tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly linear, minutely tridenticulate at the subacute apex, 3-6 cm long, 2-3 mm wide. Inflorescence a single, long-pedicellate white flower with pale yellow tails; peduncle about 5 mm long, from low on a secondary stem; floral bract thin, closely sheathing, 7 mm long; pedicel cellular-glanular, 10-15 mm long; ovary minutely glandular, 1.5-2 mm long; dorsal sepal connate to the lateral sepals for 1.5-2 mm, elliptical, concave, the 3 veins prominent externally, the apex acuminate into a thick tail 6 mm long, total length 13 mm, 5.5 mm wide; lateral sepals ovate, oblique, the margins erose, the apices acuminate into tails similar to the dorsal sepal, connate at the base above transverse carinae, each 12 mm long, 3 mm wide; petals translucent pale green, oblong-subrhombic, the apex slightly dilated, obscurely obtusely 3-lobed, 1.5 mm long, 1.25 mm wide; lip white, the blade elliptical with the apex rounded, with a pair of acute, erect lobules at the rear near the claw, the disc with a short, rounded pair of lamellae below the middle, the base unguiculate, with minute basal auricles, the claw 1.25 mm long, total length 2.75 mm, 1 mm wide; column with short, broad wings, denticulate at the apex, 2 mm long, with a foot nearly as long.

ETYMOLOGY: From the Latin *albicans*, "becoming white, or whitish," in reference to the whitish flowers.

TYPE: ECUADOR: AZUAY: western slopes of the Andes, alt. 2000 m, 1972, B. Malo s.n., cultivated in Cuenca, flowered in cult. 16 July 1977, C. Luer 1715 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This species is closely related to *M. simulatrix*, but the former may be distinguished by the very narrow, linear leaves and inflorescences no more than half the length of the leaves. Like *M. simulatrix*, the flowers become nearly black when dry. The lateral sepals are minutely erose along the margins. The petals are obscurely three-lobed at the apex. The narrowly elliptical blade of the long-clawed lip is bicarinate.

Masdevallia amaluzae Luer & Malo, sp. nov.

Planta parvula epiphytica caespitosa, caulibus secundariis brevibus, foliis coriaceis ellipticis petiolatis, pedunculo gracili tereti plus minusve horizontali, racemo paucifloro, flore parvo solitario successivo ochraceo brunneo

*The Marie Selby Botanical Gardens, 800 S. Palm Ave., Sarasota, FL 33577, U.S.A.

vittato, tubo sepalorum brevi caudis filiformibus, sepalis lateralibus in laminam plus minusve planam bifurcatam connatis, petalis subfalcatis acutis, labello anguste ligulato subacuto base crasso marginibus basalibus elevatis rotundatis.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems abbreviated, 8-10 mm long, lightly channeled, enclosed by a thin, loose, white sheath, unifoliate. Leaf erect, coriaceous, elliptical, petiolate, 3.5-5.5 cm long including the petiole, 9-11 mm wide, acute to subacute at the apex, tridenticulate, the base cuneate into the channeled petiole 1-2 cm long. Inflorescence a few-flowered (1-3) contracted raceme of successive flowers borne by an ascending or reclining to horizontal, slender peduncle 4-5 cm long, with a bract below the middle, from a node low on the secondary stem; floral bract tubular, 4 mm long; pedicel 6 mm long; ovary 3-4 mm long, with low, irregular carinae; sepals yellowish with brown veins, the veins more or less prominent externally, the dorsal sepal obovate, connate to the lateral sepals for 5 mm into a short, cylindrical tube, the free portion narrowly triangular, 3-veined, acuminate into a slender, terete tail, the total length 30-35 mm, width 5 mm, the lateral sepals connate 12 mm into an oblong, bifurcated, 6-veined lamina, cellular-glandular, the free portions triangular, the acute apices acuminate into slender tails similar to that of the dorsal sepal, the total length 30-37 mm, 7-8 mm broad together; petals translucent white with a purple midvein, subfalcate, 3.5 mm long, 1 mm wide, the apex acute, the base oblique and unguiculate below a swollen, broadly obtuse angle below the middle of the labellar margin; lip white with 3 red veins down the center, oblong-ligulate, 5 mm long, 1.25 mm wide, subacute at the apex, the base thickened, rounded, retuse, with elevated, rounded margins, hinged beneath, the disc with a low, longitudinal pair of slightly irregular calli; column green, stout, 3 mm long, with a curved foot 2 mm long.

ETYMOLOGY: Named for the region of Amaluza in the Province of Azuay, Ecuador, where the species was discovered.

TYPE: *ECUADOR*: AZUAY: epiphytic near Amaluza, alt. 2000 m, May 1973, B. Malo 51, cultivated near Cuenca, flowered in cult. 8 July 1977, C. Luer 1655 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This delicate, little species may be recognized by the slender, yellowish flowers prominently striped in brown with thin tails, borne successively by a slender, more or less horizontal peduncle. The sepals are connate into a short tube, the lateral sepals connate twice longer into a more or less flat, bifid lamina. The petals are subfalcate and acute, and the ligulate lip is narrow with three red stripes.

Masdevallia andreettae Luer, sp. nov.

Habitu *M. chimaerae* Rehb. f. et affinibus similis, sed floribus differt. Sepala flavescentia atropurpureo maculata intus papillosa extus glabra undulata caudis filiformibus, sepalum dorsale transverse cordatum, synsepalum gibbosum, petala linearia curvata apice claviformia verrucosa base dilatata lamellata serrata papillosa, hypochilium labelli concavum, epichilium multijugis transverse ovatum valde convexum rugosum.

Plant medium to large, epiphytic, caespitose; roots slender, flexuous. Secondary stems stout, channeled, 3-4.5 cm long, clothed by 2-3 loose, dry sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical, tridenticulate at the subacute apex, gradually narrowed and conduplicate below the middle, subpetiolate, 17-25 cm long, 2.5-3.5 cm wide. Inflorescence a few-flowered (3-4) raceme of successive, widely spread, horizontally dependent flowers, produced on a descending peduncle, 15-20 cm long, green, flecked with white, from low on the secondary stem; floral bract 1-2 cm long; pedicel olive-green, 2 cm long; ovary purple, subverrucose, 11-12 mm long, 7 mm broad; sepals yellowish, heavily spotted with dark purple, minutely papillose within, glabrous without, the dorsal sepal transversely cordate, united to the lateral sepals for 5 mm, the free margins undulate, the apex attenuated into a filiform tail 5 cm long, total length 70 mm, width 22 mm, the lateral sepals ovate, oblique, united for 15 mm to form a narrow mentum, the apices produced into tails similar to the dorsal sepal, total length 75 mm, 33 mm wide together; petals white spotted with purple, cartilaginous, linear, curved, the apex clavellate, rounded, convex, tuberculose, with more or less serrate margins, dilated toward the base, the inner surface with a serrate plate and papillose along the labellar margin, 11 mm long, 3 mm wide; lip acutely deflexed at the junction of the hypochile with the epichile, the hypochile concave, yellow, about 5 mm long, 5 mm wide, loosely hinged to the column-foot, the epichile white, suffused with rose, transversely ovate, obtuse, strongly convex, deeply rugose, 12 mm wide, 7 mm long unspread; column pale yellow, spotted with purple, stout, 4 mm long, 2.5 mm wide, with an equally long foot.

ETYMOLOGY: Named in honor of Padre Angel Andreetta of Cuenca, Ecuador, who discovered this species.

TYPE: *ECUADOR*: CARCHI: western declivity of the Andes, alt. 1500-2000 m, Oct. 1975, A. Andreetta & A. Hirtz 1, cultivated at Cuenca, flowered in cult. 12 July 1977, *C. Luer 1687* (HOLOTYPE: SEL).

DISTRIBUTION: Northern Ecuador.

Vegetatively this distinct species is similar to the numerous species closely related to *Masdevallia chimaera* Rehb. f. The large flower is similarly borne on a descending peduncle to face downwards with the outstretched sepals with tails paralleling the horizon. The clubbed petals protrude conspicuously from the center of the flower like the pair of stalked eyes of a snail. The dangling lip presenting its convex, furrowed surface below, resembles very much the gills of a mushroom.

Masdevallia anemone Luer, sp. nov.

Species haec *M. ventriculariae* Rehb. f. et affinitatibus similis, sed flore aurantiaco, caudis sepalorum brevibus reflexis, partibus libris sepalorum rotundatis recurvatis intus pilis densis brevibus capitatis obtectis, partibus inclusis glabris, petalis panduratis et labello oblongo obtuso marginibus supra medium deflexis distinguitur.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems blackish, 1-1.5 cm long, with a short, close, tubular sheath, unifoliate. Leaf erect, thinly coriaceous, elliptical, 7-9.5 cm long including an indistinct,

1.5-3 cm long petiole, 17-21 mm wide, the apex subacute, tridenticulate, carinate dorsally along the midvein, the base gradually narrowed to the petiole. Inflorescence a solitary, more or less horizontal, orange, tubular flower borne by a suberect, slender peduncle ca. 2.5 cm long, with a bract near the base, from a node near the base of the secondary stem; floral bract tubular, 6 mm long; pedicel 10 mm long; ovary 4 mm long; sepals glabrous externally, yellow-orange above the middle, orange below the middle with bright orange veins, connate 13-15 mm into a cylindrical, slightly ventricose, sepaline tube, glabrous within, the free portions rounded and beset with close, short, capitate hairs, abruptly produced into sharply recurved, orange tails 15 mm long, the dorsal sepal obovate-oblong, 20 mm long, 9 mm wide, the lateral sepals 18 mm long, the free portions 6 mm wide; petals orange, oblong-panduriform, 6 mm long, 3 mm wide, the apex obtuse, obscurely lobed, with a thick lamella along the lower margin ending on a rounded, dilated portion at the base; lip oblong, 4.5 mm long, 1.75 mm wide, the cordate base white, hinged beneath, suffused with purple near the middle, the margins deflexed above the middle, the apex orange, narrowly obtuse; column greenish white, edged in purple, semiterete, 4.5 mm long, with a foot 3 mm long.

ETYMOLOGY: Named for the resemblance of the flower to a sea anemone, a colorful marine polyp with a hollow, cylindrical body closed below and with a mouth above surrounded by tentacles and stinging cells, named for the fancied resemblance to the "windflowers" of the genus *Anemone*. From the Greek *anemone*, "daughter of the wind."

TYPE: *ECUADOR*: MORONA-SANTIAGO: epiphytic near Bomboiza, alt. ca. 1000 m, ca. 1968, Padre Angel Andreetta s.n., cultivated by B. Malo near Cuenca, flowered in cult. 5 Feb. 1978, *C. Luer 2458* (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

Vegetatively this species is not distinctive from its allies. The little horizontal flowers are borne on relatively short peduncles, the orange sepals form a well-developed sepaline tube, and the short, rounded, free parts recurve with acutely reflexed tails like the tentacles of a colorful sea anemone. To complete the illusion the exposed, inner surfaces of the sepals are studded with short, capitate hairs resembling the many, crowded, suction feet of a starfish, still another lowly sea animal.

Masdevallia aurea Luer, sp. nov.

Habitu *M. ventriculariae* Rchb. f. et affinis similis, sed flore solitario vivido aureo pro planta grandi, pedunculo brevi, tubo sepalorum longo arcuato compresso supra mentum constricto, parte libra sepali dorsalis transverse ovata, partibus libris sepalorum lateralium longioribus ovatis, caudis reflexis filiformibus, petalis oblongis apice dilatatis bilobatis callo longitudinali base lobo obtuso et labello oblongo supra medium dilatato marginibus revolutis sinuatis differt.

Plant small to medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems terete, short, 1-1.5 cm long, clothed by 1-2 loose, ribbed, tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical, the apex subacute, tridenticulate, the base cuneate into a channeled pe-

tiolate 1.5-3.5 cm long, total length 6-11.5 cm, 18-21 mm wide. Inflorescence a proportionately large, single, bright orange flower borne at the apex of a terete peduncle 2.5-3 cm long, from low on the secondary stem; floral bract 6 mm long; pedicel 7 mm long; ovary 4-5 mm long; dorsal sepal oblong, 24 mm long, 10 mm wide, united for 18 mm to the synsepal to form a long, somewhat arcuate, compressed tube, constricted near the middle, the free portion transversely ovate, abruptly contracted into a bright orange, recurved, filiform tail 25-27 mm long; lateral sepals protruding beyond the dorsal sepal, connate for 25 mm, forming a mentum below the narrowed middle portion of the sepaline tube, 28 mm long, 15 mm wide, the free portions ovate, the apices produced into recurved tails similar to that of the dorsal sepal; petals yellow, oblong, dilated at the rounded, bilobed apex, with a longitudinal callus above the labellar margin from near the apex to the end of an obtuse, basal lobe, 7 mm long, 2.5 mm wide; lip pale yellow, oblong-subpandurate, the margins revolute and sinuate above the middle, the apex narrowly rounded, the base truncate, hinged below, the disc 3-veined, 5.5 mm long, 2 mm wide; column pale yellow, edged below in purple, semiterete, 4 mm long, with a foot 2 mm long with an incurved extension.

ETYMOLOGY: From the Latin *aureus*, "golden, orange," in reference to the color of the flowers.

TYPE: *ECUADOR*: MORONA-SANTIAGO: eastern slopes of the Andes, alt. 1700 m, Dec. 1974, B. Malo s.n., cultivated near Cuenca, flowered in cult. 15 July 1977, C. Luer 1702 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This rare species, apparently allied to the section *Tubulosae*, may be distinguished by its single, relatively large, bright orange flower borne by a relatively short peduncle. The sepaline tube is curved and constricted near the middle, the free portions of the lateral sepals protrude beyond the dorsal sepal, and the equally bright orange filiform tails are recurved.

Masdevallia ayabacana Luer, sp. nov.

Planta mediocris ad grandis caespitosa, caulibus secundariis crassis abbreviatis unifoliatis, foliis tenuibus coriaceis anguste obovatis obtusis sensim petiolatis, pedunculo tereti longo declinato, racemo contracto paucifloro, floribus successivis carnosus purpureis intus glandulo-papillosis caudis gracilibus virescentibus sepalis longioribus, cupula sepalorum profunde gibbosa, petalis crassissimis subquadratis truncatis subtridentatis purpureo-punctatis, labello carnoso oblongo-elliptico apice obtuso verrucoso purpureo-punctato.

Plant medium to large, presumably epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, to about 2 cm long, with 2-3 thin, tubular sheaths, unifoliate. Leaf erect, thin, coriaceous, dull green, narrowly obovate, 10-23 cm long, 26-33 mm wide, obtuse, gradually narrowed into a channeled petiole. Inflorescence a contracted, few-flowered (3-5) raceme of successive flowers, the peduncle terete, purplish, prostrate to declining, 25-34 cm long, from a node low on the secondary stem; floral bract thin, oblique, 1.5 cm long; pedicel thick, about 1 cm long; ovary about 11 mm long; sepals fleshy, red-purple with slender, yellow to green tails 5-6 cm long, glandular-papular within, the dorsal sepal subtriangular, united to the lateral

sepals for 8-9 mm, total length 75 mm, 15 mm wide, the lateral sepals ovate, oblique, connate for about 17 mm into a concave, gibbous synsepal, forming with the dorsal sepal a deep sepaline cup, total length 76 mm, 34 mm wide together; petals very thick, cream with purple spots, subquadrate, 5 mm long, 3 mm wide; contracted toward the base, truncate and bluntly subtridentate at the apex, slightly grooved centrally; lip thick, orange spotted with purple, oblong-elliptical, 7 mm long, 3 mm wide, shallowly channeled, verrucose at the obtuse apex with a thick tuberosity beneath, the base retuse, hinged beneath; column stout, 4 mm long, with a short foot.

ETYMOLOGY: Named for the region where the species was discovered.

TYPE: PERU: PIURA: near Ayabaca, R. Stumpfle s.n., cultivated by J & L Orchids, at Easton, Ct., and T. Vigliotti, Ft. Lauderdale, Fla., flowered in cult. 28 Aug. 1976, *C. Luer* 2269 (HOLOTYPE: SEL).

DISTRIBUTION: Peru.

This distinctive species is remarkable in the long, declining, terete peduncle with successive flowers. The large, long-tailed, fleshy flowers are papular-pubescent within; the thick, unguiculate, rectangular petals are truncate and broadly tridentate; the obtuse apex of the thick, oblong lip is verrucose.

Masdevallia brenneri Luer, sp. nov.

Masdevalliae guttulatae Rchb. f. similis sed sepalis glabris, sepalo dorsali crasso horizontali, cupula sepalorum synsepaloque applanatis et apicibus sepalorum lateralium crassissimis ecaudatis notabilis.

Plant medium in size, epiphytic, densely caespitose; roots slender, flexuous. Secondary stems abbreviated, 1-2 cm long, with 2-3 short, thin sheaths, unifoliate. Leaf erect, coriaceous, narrowly obovate to elliptical, subacute, tridenticulate, gradually narrowed toward the subpetiolate base, 7-11 cm long, 10-13 mm wide. Inflorescence a contracted, several-flowered (4-8) raceme of successive, light green, fleshy flowers borne by an erect, triquetrous peduncle, 6-13 cm long, from near the base of a secondary stem; floral bracts imbricating, 8-10 mm long; pedicel 10-12 mm long; ovary 3 mm long; dorsal sepal horizontal, rhombic, united to the lateral sepals for 3 mm, the apex produced into a 9 mm long, 2 mm thick tail, total length 16 mm, width 5 mm; lateral sepals light green dotted with rose centrally, united for 9 mm into a horizontally flattened, subquadrate, shallowly gibbous, bifid lamina, the free apices thick, triangular, 7 mm long, total length 14.5 mm, 11 mm wide together; petals fleshy, white, dotted and suffused with rose, oblong, obscurely bidentate at the truncate apex, with a longitudinal callus above the labellar margin and produced into a rounded swelling near the base, 5 mm long, 1.5 mm wide; lip white with purple dots, oblong, obtuse, with a low pair of folds near the middle, 4 mm long, 1.75 mm wide; column terete, 4 mm long, the foot short, spotted with purple, with a very short, incurved extension.

ETYMOLOGY: Named in honor of Joe Brenner of Puyo, Ecuador, who discovered the species.

TYPE *ECUADOR*: PASTAZA epiphytic in cloud forest near Mera, alt. 1000 m, J. & L. Kuhn & J. Brenner s.n., cultivated at Easton, Ct., flowered in cult., 18 May 1977, *C. Luer 1640* (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

Although distinct among the winged-peduncle species (section *Alaticaulis*), this species superficially resembles *Masdevallia guttulata* Rehb. f. The flower of *M. brenneri* is easily recognized by the pale green, glabrous flowers, a broad, transversely flattened sepaline cup, rosy within, with the thick, horizontal tail of the dorsal sepal overlying the broad, protruding synsepal. The lateral sepals end in thick, subacute angles. The petals and lip of the two species are very similar.

***Masdevallia carmenensis* Luer & Malo, sp. nov.**

Species haec *M. amaluzae* Luer & Malo affinis, sed flore grandiore albo-virescenti purpureo vittato, tubo sepalorum longicylindrico cum mento brevi, synsepalo concavo, petalis oblongis acuminatis cum callo basali rotundato, labello oblongo-obovato obtuso arcuato marginibus basalibus rotundatis erectis, pede columnae longiore notabilis.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, 10-15 mm long, unifoliate, enclosed by a short, close, tubular sheath. Leaf erect, coriaceous, elliptical, petiolate, 5-8 cm long including the 1-2.5 cm long petiole, 14-17 mm wide, the acute apex tridenticulate, the base cuneate into the channeled petiole. Inflorescence a few-flowered (2-3?), short raceme of successive flowers borne by a slender, more or less horizontal peduncle 5-6 cm long, with a bract below the middle, from a node low on the secondary stem; floral bract tubular, 5 mm long; pedicel 7 mm long; ovary green, 3 mm long, 6-ribbed; sepals greenish white, prominently striped in deep purple, with zones of purple suffusion between the stripes, subcarinate along the veins externally, the dorsal sepal obovate, connate to the lateral sepals for 12 mm into a well-developed, cylindrical tube, the free portion narrowly triangular, microscopically erose, 3-veined, acuminate into a slender, white tail, the total length 48 mm, 6 mm wide, the lateral sepals connate 20 mm into an oblong, concave synsepal, forming at the base a small mentum with the column-foot, 6-veined, cellular-glandular within, the free portions triangular, the acute apices acuminate into slender tails similar to that of the dorsal sepals, the total length 51 mm, 17 mm wide together; petals white marked with red-purple, oblong, 6 mm long, 1.75 mm wide, the apex acuminate, acute, with a rounded callus at the base of the labellar margin; lip white, oblong-obovate, 8 mm long, 4.25 mm wide, arcuate, the apex obtuse, the base thickened, truncate, with erect, rounded margins, hinged beneath, the disc with a converging pair of low lamellae; column stout, greenish white marked with purple, 4 mm long, with a thick foot 6 mm long, with an incurved extension.

ETYMOLOGY: Named for the area of "Carmen," where the species was found.

TYPE *ECUADOR*: MORONA-SANTIAGO: epiphytic in cloud forest on the eastern slopes of the Andes near Carmen, alt. 2200 m, April 1975, B. Malo s.n., cultivated near Cuenca, flowered in cult. 4 Feb. 1978, *C. Luer 2455* (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

This small species is allied to *Masdevallia amaluzae* Luer & Malo and *M. patula* Luer & Malo. *Masdevallia carmenensis* may be distinguished by the whitish flowers veined in deep purple with greenish white tails. The sepals are connate into a well-developed sepaline tube. The concave synsepal forms a short mentum at the base with a long column-foot. The narrowly oblong petals are pointed with a rounded callus at the base, and the arcuate, oblong lip is widest above the middle.

***Masdevallia chaetostoma* Luer, sp. nov.**

Habitu *M. polystictae* Rchb. f. et affinibus similis, sed planta parvula, racemo erecto subsecundo laxo paucifloro, floribus albis, tubulo sepalorum arcuato cylindrico stomate villosa caulis filiformibus divergentibus, petalis anguste oblongis apice denticulatis, et labello purpureo elliptico bilamellato differt.

Plant small, epiphytic to terrestrial, caespitose; roots slender, flexuous. Secondary stems slender, short, 6-10 mm long, enclosed by a loose, ribbed, tubular sheath, unifoliate. Leaf erect, coriaceous, obovate, tridentate at the obtuse to subacute apex, the base gradually cuneate into a grooved petiole, 1-1.5 cm long, total length 2.5-4 cm, 7-11 mm wide. Inflorescence an erect, loosely few-flowered (4-7), subsecund raceme, 9-13 cm tall including the peduncle, the peduncle filiform, from low on the secondary stem; floral bract loose, oblique, 3 mm long; pedicel 1 mm long; ovary 1 mm long, with undulate wings; sepals white, connate into a curved, cylindrical tube, glabrous without, villous within near the opening, with filiform, diverging, greenish to orange tails 11-12 mm long, the dorsal sepal united to the lateral sepals for 5 mm, oblong, concave, 7 mm long, 3 mm wide, the free portion broadly triangular, the obtuse apex tapered into the tail, the lateral sepals connate for 3.5 mm, forming a mentum at the base with the column-foot, obovate, oblique, acuminate into tails similar to that of the dorsal sepal, the lamina 6 mm long, 4 mm wide spread out; petals translucent white, narrowly oblong, irregularly denticulate at the truncate apex, slightly dilated along the labellar margin near the base, 2 mm long, 0.3 mm wide; lip red-purple, elliptical, the rounded sides curved up, the apex broadly rounded, minutely irregular, deflexed, the base rounded, retuse, hinged beneath, the disc with a pair of transverse, rounded lamellae, 2.75 mm long, 1.5 mm wide; column semi-terete, greenish white, 2 mm long, with a curved foot 1 mm long.

ETYMOLOGY: From the Greek *chaete*, "long hair," and *stoma*, "mouth, opening," in reference to the long hairs within the opening of the sepaline tube.

TYPE: ECUADOR: PICHINCHA: along the old road between Quito and Santo Domingo, above Chiriboga, alt. 2500 m, Dec. 1973, B. Malo s.n., cultivated in Cuenca, flowered in cult. 15 July 1977, C. Luer 1709 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

ADDITIONAL MATERIAL EXAMINED: ECUADOR: PICHINCHA: terrestrial on the road embankment near km 30 of the old road between Quito and Santo Domingo, above Chiriboga, alt. ca. 3000 m, 29 July 1977, C. Luer & J. Luer 1776 (SEL).

This little, frail member of the section *Polystictae* may be recognized by the small leaves and the thrice longer, filiform peduncle. The opening of the white, tubular flowers is beset with long, white hairs, and the sepaline tube terminates in widely spreading capillary tails that are as long as or longer than the tube itself.

Masdevallia colossus Luer, sp. nov.

Species haec *M. leontoglossae* Rehb. f. et affinis cognata, sed pedunculo pedicelloque elongato, flore grandi caudis sepalorum longissimis et labello magno crasso verrucosissimoque distinguitur.

Plant medium-sized to large, presumably epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, channeled, 4-6 cm long, enclosed by 2-3 loose, tubular sheaths, unifoliate. Leaf erect, thickly coriaceous, narrowly obovate, 12-18 cm long including the petiole, 3-4 cm wide, the apex obtuse to rounded, tridenticulate, the base gradually narrowed into a channeled petiole 1-2 cm long. Inflorescence a single-flowered, erect peduncle 10-11 cm long, from a node on the secondary stem; floral bract tubular, 25-28 mm long; pedicel spotted with purple dorsally, 6 cm long, 4 mm thick; ovary stout, spotted with purple, 11-12 mm long; flowers large, fleshy, with a disagreeable odor; sepals green, minutely spotted with purple, shortly pubescent within above the middle, the dorsal sepal ovate, connate to the lateral sepals for 12 mm into a short, broad, cylindrical cup, the free portion triangular, acuminate into a thick, narrow tail, total length 9 cm, width 16 mm, the lateral sepals obliquely ovate, connate to the column-foot for 16 mm and to each other for 9 mm to form a prominent, deep, obtuse mentum, studded with purple verrucae below the middle and white hairs above, the apices acuminate into similar semiterete tails, total length 8 cm, width 15 mm; petals white with a purple midvein, oblong, 12 mm long, 3.25 mm wide, acute at the apex, slightly dilated and thickened along the labellar margin above the middle; lip greenish white, suffused and dotted with purple, very thick, oblong, 18 mm long, 7 mm wide, the apex obtuse, verrucose, the disc with a longitudinal pair of verrucose calli ending near the apex, the base truncate-retuse, with obscure nectiferous angles, hinged below; column stout, greenish white edged in purple, 11 mm long, with an equally long, spotted foot with a short, incurved extension.

ETYMOLOGY: From the Latin *colossus*, "a gigantic statue of antiquity," in allusion to the huge size of the flower.

TYPE: PERU: AMAZONAS: collected near Molinopampa, purchased and cultivated by Don Richardson, Long Island, New York, flowered in cult., 24 Nov. 1977, C. Luer 2239 (HOLOTYPE: SEL).

DISTRIBUTION: Northern Peru.

This species is closely related to the large number of species similar to *Masdevallia leontoglossa* Rehb. f., but it is readily distinguished by the huge, solitary flower borne by a long peduncle and a long pedicel. The long-tailed dorsal sepal reaches 9 cm in length and the long tails of the lateral sepals trail downward. Excluding the fleshy, short-cylindrical sepaline cup, the span of the flower reaches 15-16 cm. The petals and the lip are typical of the section, but the immense lip is very thick and markedly verrucose at the apex.

Masdevallia delphina Luer, sp. nov.

Habitu *M. melanopus* Rchb. f. et affinis similis, sed racemo gracili sparsifloro, floribus parvis, sepalis purpureo punctatis in tubulum sepalorum subglobosum connatis, caudis brevibus crassissimis, petalis oblongis tridentatis et labello subpandurato apice rotundato undulato eroso prope medium biplicato dignoscenda.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, terete, 1-1.5 cm long, enclosed by 2-3 thin, tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical, tridenticulate at the subacute apex, the base cuneate into a channeled petiole 1.5-2.5 cm long, total length 3-6.5 cm long, 8-12 mm wide. Inflorescence a slender, erect, distantly several-flowered (6-8), subsecund raceme to 20 cm tall including the peduncle, the peduncle slender, from a node on the secondary stem; floral bract thin, tubular, 3-4 mm long; pedicel 5-6 mm long; ovary 2 mm long; flowers suffused and dotted with purple on lavender, with short, very thick tails, yellow on the inner surface, purplish on the outer surface; dorsal sepal united for 4 mm with the lateral sepals to form a subglobose, fleshy, sepaline tube, obovate, concave, minutely pubescent above the middle within, the apex rounded, with a 2 mm long, 1 mm thick, blunt tail, total length 7 mm, width 3 mm unspread; lateral sepals connate for 2.5 mm at the base to form a suborbicular lamina with a rounded mentum near the middle, the apices produced into tails similar to those of the dorsal sepal, total length 6 mm, 3.5 mm wide together unspread; petals white with a few purple spots, oblong, slightly dilated at the tridentate apex, with a longitudinal callus above the labellar margin, 2.25 mm long, 0.6 mm wide; lip white marked with purple, oblong-subpanduriform, the apex rounded, undulate, minutely erose, with erect sides below the middle, ending in rounded folds above the middle, retuse at the base, 2.5 mm long, 1.1 mm wide; column greenish white, 2 mm long, with a foot 1.5 mm long.

ETYMOLOGY: From the Latin *delphinus* (Greek *delphos*), "a dolphin or porpoise," in allusion to the resemblance of flower to the head of a dolphin.

TYPE: *ECUADOR*: LOJA: western slopes of the Cordillera, alt. 2000 m, Dec. 1974, B. Malo s.n., cultivated near Cuenca, flowered in cult. 16 July 1977, C. Luer 1716 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

The sepals of *Masdevallia delphina* are united for over half their length into thick, little, tubular flowers with an angled mentum and short, fleshy, rounded tails. Each flower resembles the head and nose of a minute, bottle-nosed dolphin. The petals are three-toothed at the apex. The lip is rounded and erose at the apex and provided with a pair of rounded folds near the middle.

Masdevallia deltoidea Luer, sp. nov.

Haec species *M. velutinae* Rchb. f. affinis, sed statura minore, pedunculo unifloro, ovario cristato, flore plus minusve complanato subtriangulari ochroleuco dense pubescenti brevicaudato, petalis apice papillosis et labello spatulato epichilio transverse elliptico plurilamellato distinguitur.

Plant small to medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems channeled, 3-5.5 cm long, enclosed by a loose, tubular sheath and another 1-2 at the base, unifoliate. Leaf erect, thinly coriaceous, narrowly obovate to narrowly elliptical, 12-17 cm long, 2-2.5 cm wide, carinate on the back, subacute to obtuse at the apex, narrowed gradually to the subpetiolate base. Inflorescence single-flowered, on a descending peduncle 8-10 cm long, with 5-8 bracts, from a node on the secondary stem; floral bract thin, 8-9 mm long; pedicel purple, 10 mm long; ovary red-purple, 4 mm long, 3 mm wide, with 6 fringed crests; sepals widely spread, more or less flat, glabrous externally, copiously pubescent within, light orange-brown to nearly white, the acute apices acuminate into orange-brown, filiform tails 6-15 mm long, the dorsal sepal triangular, united to the lateral sepals for 3 mm, 10-12 mm long, 8-11 mm wide, the lateral sepals ovate-triangular, connate for 8-9 mm, forming a shallow mentum below the column-foot, 10-12 mm long, 10-12 mm wide; petals oblong, slightly dilated near the middle, 3.5 mm long, 2 mm wide, yellow with light brown spots, the subacute apex papillose, obscurely bivalved; lip fleshy, spatulate, orange-brown, 5 mm long, 2.75 mm wide, the hypochile 3 mm long, 2.25 mm wide, deflexed, with rounded, erect, lateral margins, cleft centrally, the base concave and hinged to the column-foot, the epichilum transversely elliptical, 2 mm long, 2.75 mm wide, very shallowly concave to flat, with several radiating carinae to the minimally undulate margin; column yellow, stout, 4 mm long, with a foot 3 mm long.

ETYMOLOGY: From the Latin *deltoideus*, "deltoid or triangular," in reference to the shape of the flower.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: epiphytic between Loja and Zamora, alt. 2800 m, B. Malo s.n., cultivated near Cuenca, flowered in cult. 16 July 1977, C. Luer 1713 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

This small species may be recognized by the triangular appearance of the solitary flower. Each sepal being slightly convex, the flower is more or less flat and lacking a sepaline cup. The face of the flower is ivory suffused with pale orange-brown, and the widely spread, slender tails are orange-brown. The ovary is comparatively thick with six crested wings.

Masdevallia didyma Luer, sp. nov.

Habitu *M. triaristellae* Rehb. f. et affinis similis, sed pedunculo verruculoso, sepalis lateralibus prope apices acutos in synsepalum anguste oblongum breviter bicaudatum connatis, et petalis oblongis acutis dignoscenda.

Plant very small, epiphytic, caespitose; roots slender, flexuous. Secondary stems abbreviated, 2-4 mm long, with 1-2 short, thin, tubular sheaths, unifoliate. Leaf erect, coriaceous, thick, dark green, speckled and suffused with purple beneath, linear-elliptic, subacute, minutely tridenticulate, the base narrowly cuneate, 2.5-4.5 cm long, 3-4 mm wide. Inflorescence a few-flowered (2-3), contracted raceme of single, successive flowers borne by a slender, erect, verrucose peduncle 4.5-9 cm long, from a node on the secondary stem; floral bract tubular, 3-4 mm long; pedicel 4 mm long; ovary subverrucose, with undulate carinae, 2 mm long; dorsal sepal yellow, marked

with purple, united to the lateral sepals for 2 mm, the free portion broadly triangular, with a verrucose carina externally, contracted into an erect, slender, yellow tail 15 mm long, total length 22 mm, width 6 mm; lateral sepals heavily suffused and veined in purple, connate to within 3 mm of the apices into a narrowly linear-ovate synsepal, minimally gibbous toward the base, the acute apices prolonged into 4 mm long, straight, closely parallel, yellow tails, total length 25-30 mm, 6 mm wide; petals translucent yellow with a purple spot below the middle, oblong, acute, 3.5 mm long, 1 mm wide; lip red-purple, narrowly ovate, rounded at the apex, sagittate at the base, with a pair of slightly undulating carinae extending to above the middle, 4 mm long, 1.5 mm wide; column terete, 4 mm long, with a short foot.

ETYMOLOGY: From the Greek *didymos*, "doubled, twinned," in reference to the pair of short, closely parallel tails of the synsepal.

TYPE: *ECUADOR*: ZAMORA-CHINCHIPE: epiphytic along the road between Loja and Zamora, alt. ca. 1700 m, May 1973, B. Malo s.n., cultivated in Cuenca, flowered in cult. 14 July 1977, *C. Luer 1705* (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

ADDITIONAL MATERIAL EXAMINED: *ECUADOR*: ZAMORA-CHINCHIPE: same area, 5 June 1976, *J. Brenner 96* (SEL); same area, cultivated by Martha Robledo, *R. Escobar 1243* (SEL).

This delicate, little species is similar to other members of the Section triaristellae. The narrow, fleshy leaves are flecked with purple beneath, and the verrucose peduncle produces successively a few, distinctive, slender flowers. The slender tail of the dorsal sepal stands erect. The lateral sepals are very narrow and connate to near the apices. Continuing in the same plane from the apices protrudes a closely parallel pair of short, straight tails.

Masdevallia dolichopoda Luer, sp. nov.

Species haec ab *M. simula* Rehb. f. differt inflorescentia quam foliis linearibus verrucosis subaequilonga, racemo paucifloro, floribus successivis pallido flavovirentibus longipedicellatis, pedicello verruculoso, sepalo dorsali suborbiculari concavo caudato, sepalis lateralibus aliquantum minoribus ovatis obliquis acuminatis base transverse carinatis, petalis subrhombeis supra medium unidentatis, labello longe unguiculato suborbiculari postice bilobulis retrorsis, columna bidentata pede longiore.

Plant small, epiphytic, caespitose; roots thick, flexuous. Secondary stems abbreviated, 3-8 mm long, with 2 short, thin, tubular sheaths, unifoliate. Leaf erect, thickly coriaceous, verruculose, narrowly linear, subacute, minutely tridenticulate, the base narrowly cuneate, 2.5-3 cm long, 2-2.5 mm wide. Inflorescence an erect, few-flowered (3-4) raceme, the flowers clear pale yellow-green, long-pedicellate, produced singly successively, the peduncle 1-2 cm long, from a node on the secondary stem; floral bract thin, tubular, deciduous, 3-5 mm long; pedicel verruculose, 10-15 mm long; ovary verruculose, 1.5 mm long; dorsal sepal united to the lateral sepals for barely 2 mm, broadly ovate to suborbicular, concave, the apex acuminate into a tail about 3 mm long, total length 8 mm, 4 mm wide; lateral sepals ovate, oblique, the apices acuminate, connate near the transverse callus above the

base, each 6.5 mm long, 2 mm wide; petals translucent yellow-green, oblong to subrhombic, broadly obtuse, with an acuminate tooth along the labellar margin above the middle, 1.75 mm long, 1.25 mm wide at the tooth; lip pale yellow-green, the blade suborbicular with a pair of acute lobules directed posteriorly, at the rear near the claw, the disc with low converging calli from the bases of the lobules, the base narrowly unguiculate with minute basal auricles, the claw 1.25 mm long, total length 2.75 mm, width 1.5 mm; column 1.5 mm long with a pair of acute wings or teeth near the middle, with a foot 2 mm long.

ETYMOLOGY: From the Greek *dolichos*, "long," and *podion*, "foot," hence "long-stalked," in reference to the long-pedicellate flowers.

TYPES: *ECUADOR*: PICHINCHA: above Chiriboga, alt. 2600 m, along the old road between Quito and Santo Domingo, B. Malo s.n., flowered in cult. 16 July 1977, C. Luer 1714 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This small species of the section *Rhombopetalae* may be distinguished by densely caespitose, narrowly linear leaves with a minutely verrucose surface. The peduncle emerges from near the base of the abbreviated secondary stem to bear a few, successive, pale yellow-green, long-pedicellate flowers. The lower flowers may reach half the length of the leaves, but as the inflorescence elongates with progressive flowering, the later flowers may reach the tips of the leaves in height. The long pedicel is minutely warty. The flowers, devoid of any spots, are not remarkably different from others in the section. The dorsal sepal is proportionately large and concave with an acuminate apex, and the apices of the smaller lateral sepals are also acuminate. The oblong petals bear a tooth above the middle.

***Masdevallia dura* Luer, sp. nov.**

Planta mediocris, caulibus secundariis crassis sulcatis, foliis erectis longiusculis crassis rigidis duris linearibus base subpetiolatis canaliculatis, racemo paucifloro pedunculo tereti repenti flore ochraceo successivo, sepalis subaequalibus ovatis effusis crassis duris intus guttatis verruculosisque in cupula cylindrica brevi ringenti caudis teretibus rigidis, petalis carnis ellipticis apice subtridentatis, labello ligulato punctato apice rotundato papilloso base exciso bilobulato, lobulis hemisphaericis profunde concavis.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, shallowly sulcate, 2-3.5 cm long, enclosed by 1-2 thin, close, tubular sheaths, unifoliate. Leaf erect, thick, coriaceous, rigid, linear to narrowly elliptical, tridentate at the subacute apex, the base gradually narrowed, subpetiolate, channeled, 12-18 cm long, 23-28 mm wide. Inflorescence a few-flowered (3-6), contracted raceme of successive flowers, produced by a horizontally creeping or descending peduncle, 8-10 cm long, terete, with a few, distant bracts, from low on the secondary stem; floral bracts papery, imbricating, 8-10 mm long; pedicel 5-7 mm long; ovary thick, 8-9 mm long, 4-5 mm wide, with multiple raised dots; sepals fleshy, thick, rigid, externally dull yellow, minutely and sparsely pustulate, internally densely spotted with purple and verrucose, ovate, the lateral sepals oblique, connate to each other for about 5 mm into a short, thick, open cylindrical

tube, the apices acuminate into spreading, yellow-orange, rigid, terete tails about 2 cm long, total length of each sepal 32-35 mm, 10-11 mm wide; petals fleshy, cream, marked with purple, elliptical, 5.5 mm long, 2.5 mm wide, with a low, curved callus near the labellar margin, the apex subtruncate with a thick, central, obtuse tooth; lip oblong-ligulate, 7 mm long, 3.25 mm wide, papillose and retuse at the rounded apex, the disc covered with minute, raised purple dots, with a short pair of curved carinae above the middle, the base with a central sinus, bilobed with hemispherical concavities; column white, cylindrical, 6 mm long, with a thick foot.

ETYMOLOGY: From the Latin *durus*, "hard," in reference to a quality of the leaves and flowers.

TYPE: *ECUADOR*: LOJA: Cordillera de Sabanilla, alt. 2900 m, Sept. 1973, B. Malo s.n., cultivated near Cuenca, flowered in cult. 14 July 1977, C. Luer 1698 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

The flowers of this species are produced successively in a contracted raceme borne by a descending peduncle. The thick, cardboard-like, intensely purple-spotted sepals with their rigid orange tails spread from a short, cylindrical sepaline tube. Nectaries at the base of the lip are well-developed.

Masdevallia echo Luer, sp. nov.

Habitu *M. infractae* Lindl. similis, sed floribus majoribus, cupula sepalorum subglobosa, caudis sepalorum lateralium filiformibus approximate parallelis, petalis distincte tridentatis, labello apice denticulato et angulis laterali-bus labelli acutis differt.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems stout, abbreviated, 1-2 cm long, with 2 short, greenish brown sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical to, 10-16 cm long, 18-28 mm wide, the apex subacute to obtuse, tridenticulate, gradually narrowed into a channeled, subpetiolate base. Inflorescence a few-flowered (3-4), contracted raceme of successive flowers at the apex of an erect, stout, triquetrous peduncle, 15-19 cm long, 4 mm in width, from near the base of a secondary stem; floral bract papery, 2-2.5 cm long; pedicel 3 cm long; ovary 6 mm long; sepals olive-green, suffused with red-purple especially within where the surface is minutely pubescent, the dorsal sepal united to the lateral sepals for 18-20 mm, cuneate, the free portion broadly triangular, abruptly contracted into a yellow, filiform tail 5 cm long, total length 75 mm, 14 mm wide, the lateral sepals connate for about 1 cm forming a second, larger mentum above the fold of the basal mentum, each sepal broadly and obliquely triangular, forming with the dorsal sepal a subglobose sepaline cup, abruptly contracted into yellow-green, closely parallel, filiform tails 3.5 cm long, total length 52 mm, 33-38 mm broad spread out; petals white flecked with purple, oblong, 7 mm long, 2 mm wide; the apex tridentate with the middle tooth longest, with parallel, low, smooth thickenings to either side of the shallow, central sulcus; lip white spotted with purple, narrowly oblong-subpandurate, 8 mm long, 2 mm wide, the apex serrulate, subacute, with a pair of forward directed, acute lateral lobes from the folds near the middle, the base truncate, hinged beneath; column terete, greenish white, 6 mm long, with a thick foot.

ETYMOLOGY: Named for the Greek mythological nymph Echo, known by her repetitious voice.

TYPE: PERU: JUNIN: obtained by J & L Orchids from R. Stumpfle s.n., collected near Chanchamayo, cultivated at Easton, Ct., flowered in cult. 8 Nov. 1977, *C. Luer 2127* (HOLOTYPE: SEL); also cultivated by Tony Vigliotti in Ft. Lauderdale, flowered in cult. Aug. 1976, *C. Luer 1638* (SEL).

DISTRIBUTION: Peru.

Very possibly herbarium specimens of this species have been identified as the Brazilian *Masdevallia infracta* Lindl. to account for the report of the latter species from Peru. The flower of *M. echo* is considerably larger with a suborbicular sepaline cup. The long tail of the dorsal sepal is held erect and the two closely parallel tails of the lateral sepals are deflexed in the opposite direction. These features are commonly distorted in dried specimens. The lateral folds of the pandurate lip project with acute angles, and the apex of the lip is denticulate.

Masdevallia elata Luer, sp. nov.

Inter species sectionis *Rhombopetalae* statura grandi, caulibus secundariis elatis, floribus aurantiacis brunneo maculatis, petalis uncinatis, lamina labelli denticulata et columna bidentata dignoscenda.

Plant small but large for the section, epiphytic, densely caespitose; roots fine, flexuous. Secondary stems elongated, 1-4 cm long, unifoliate, with 2-3 tubular, ribbed sheaths. Leaf erect, fleshy, coriaceous, dull green, lightly suffused with purple beneath, very narrowly elliptical to linear, 3-9 cm long, 5-6 mm wide, the acute apex tridenticulate, the base narrowly cuneate, subpetiolate. Inflorescence a floriferous succession of single flowers borne by peduncles up to 1 cm long, from near the apex of the secondary stem; floral bract loose, thin, tubular, 3 mm long; pedicel 3 mm long; ovary 3-winged, pyramidal, 1.5 mm long; sepals widespread, orange, spotted with red-brown, the dorsal sepal elliptical-obovate, acute, 6 mm long, 3 mm wide, connate to the lateral sepals for less than 1 mm, the lateral sepals ovate, oblique, 4 mm long, 2.5 mm wide, the apex shortly acuminate, connate and reflexed at the base below a transverse, thickened, subcarinate fold; petals red-brown, dolabriliform, polygonal, 3 mm long, 2.5 mm wide, the apex subacute, obtusely angled on the upper margin, with a broad, subacute, uncinat process on the lower margin; lip orange-brown, spatulate, 2.5 mm long, 1.5 mm wide, the claw 1 mm long with basal lobules, the lamina more or less elliptical, the apex broadly rounded, denticulate, recurved, with a pair of acute retrorse angles toward the claw; column red-brown, 2 mm long, winged with a pair of short, thick retrorse teeth near the middle, the foot 1.5 mm long.

ETYMOLOGY: From the Latin *elatus*, "tall," in reference to the lengths of the secondary stems and leaves compared to other members of the section.

TYPE: ECUADOR: MANABI: epiphytic in low mountains between Quevedo and Puerto Viejo, alt. ca. 500 m, July 1977, greenhouse acc. no. 77-2678, flowered in cult. 29 Oct. 1977, *C. Luer & C. H. Dodson et al. 2111* (HOLOTYPE: SEL).

DISTRIBUTION: Coastal Ecuador.

This species was found to be locally abundant in one area of the relatively dry mountain ranges of Coastal Ecuador. At the time of its discovery, large clusters of the plants were bearing fruit. They were thought to be a species of *Pleurothallis* because of the well-developed secondary stems. Several months later the plants produced many orange flowers, typical of the "Simula-complex," with spots of brown that imparted a rusty color. Besides the color of the flowers and long secondary stems, the species is distinguished by the uncinatate petals and the denticulate margin of the lip.

Masdevallia empusa Luer, sp. nov.

Species haec *M. ephippium* Rchb. f. cognata, sed habitu et flore minore, cauda sepalis dorsalis deflexa, synsepalo rugoso conduplicato non inflato, petalis cum dente basali et apice labelli laciniato papilloso differt.

Plant medium-sized, epiphytic, caespitose; roots coarse, flexuous. Secondary stems abbreviated, 1-2 cm long, concealed by 1-2 tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly obovate, 8-11 cm long, 14-18 mm wide, tridenticulate at the subacute apex, the base gradually narrowed to an indistinct, channeled petiole. Inflorescence a congested raceme of several (5-6), successive flowers borne by an erect, sharply triquetrous peduncle 18-21 cm long, from near the base of a secondary stem; floral bracts white, papery, imbricating, 10-18 mm long, concealing the pedicel about 1 cm long; ovary shiny, greenish white, 5 mm long; dorsal sepal red-brown, obovate, connate to the lateral sepals for 8-9 mm to form a subconical cup, the free portion narrowly triangular, the apex attenuated into a deflexed, filiform tail, total length 55 mm, width 7 mm; lateral sepals red-brown, connate about 20 mm into a subcircular lamina, 22 mm long, 19 mm wide, more or less conduplicate, rugose within, forming a short mentum at the base behind a transverse fold, the rounded apex produced abruptly into reflexed, filiform tails about 19 mm long; petals white, dotted with pink, oblong, 7.5 mm long, 2 mm wide, the obtuse apex apiculate, with a low, longitudinal callus above the labellar margin, with a short, blunt, incurved tooth at the base; lip white, dotted with red, pandurate, 7 mm long, 2.6 mm wide, ovate above the middle, the subacute apex denticulate-laciniate, red-papillose, oblong below the middle, the base truncate, hinged beneath; column white, semiterete, 5 mm long, the foot short with an incurved extension.

ETYMOLOGY: From the Latin *empusa*, "a hobgoblin," in allusion to the appearance of the flower.

TYPE: PERU: HUANUCO: epiphytic between Tingo Maria and Pucallpa, alt. ca. 700 m, March 1975, J. Kuhn s.n., cultivated in Easton, Ct., flowered in cult. 8 Nov. 1977, C. Luer 2122 (HOLOTYPE: SEL).

DISTRIBUTION: Peru.

This small relative of *Masdevallia ephippium* Rchb. f. was discovered recently by Janet Kuhn of Easton, Ct., and has been successfully cultivated by her. The lateral sepals of the red-brown flowers are deeply rugose within, much the same as those of *M. ephippium*, but without the saccate inflation. The sepals fold out, much as they do in the Ecuadorian form of *M. ephippium*, not incurved as they are in the Colombian form. The long, narrow, caudate dorsal sepal curves downward to join the reflexed tails of the lateral sepals.

Masdevallia felix Luer, sp. nov.

Species haec *M. calliferae* Schltr. similis sed ovario cristato, caudis sepalorum longioribus et epichilio labelli proportione minore marginibus non-incurvatis sine carinis quinque radiantibus differt.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems narrow, conduplicate, 2-5.5 cm long, unifoliate, enclosed by 2-3 loose, tubular sheaths. Leaf erect, thinly coriaceous, very narrowly elliptical, 15-22 cm long, 17-25 mm wide, carinate dorsally along the midvein, the acute apex tridenticulate, gradually narrowed below into a conduplicate base. Inflorescence a short, 3-6 cm long, several-bracted, purple, more or less horizontal, single-flowered peduncle from the base of the secondary stem; floral bract and pedicel each 5-6 mm long; ovary 3 mm long, with 6 low crests, usually developing into a capsule; sepals dull white, glabrous externally, the dorsal sepal transversely elliptical, 8 mm long, 9 mm wide, connate 5 mm to the lateral sepals to form a short, cylindrical tube, suffused with rose and dotted with red below the middle within, the free portion erect, white, pubescent, obtusely triangular, produced into an erect, dark red tail 25-35 mm long, the lateral sepals subquadrate, oblique, 11 mm long, 9 mm wide, connate 9 mm to form a broad, shallow mentum, suffused with red-orange below the middle with red dots and clumps of red hairs, yellowish white and pubescent above the middle, the obtusely triangular apices produced into tails similar to that of the dorsal sepal; petals yellowish-white marked with dark purple, oblong, 3 mm long, 1.25 mm wide, the apex bivalved, papillose between the laminae, the inner lamina short, denticulate, the outer lamina rounded; lip pandurate, white suffused with pink to red, 4.5 mm long, 2 mm wide, the hypochile thick with obtuse, erect marginal angles, broadly channeled centrally, the base concave, hinged to the column-foot, the epichile deflexed, suborbicular, 1.5 mm long, 1.5 mm wide, shallowly concave with a thickened central lamella flanked by a short marginal lamella to either side; column stout, yellowish white, 3 mm long, with an equally long, stout foot.

ETYMOLOGY: From the Latin *felix*, "fruitful," in reference to the large percentage of capsules produced.

TYPE: *ECUADOR*: PICHINCHA: epiphytic in cloud forest above Chiriboga, alt. ca. 2000 m, along the old road between Quito and Santo Domingo, 1975, B. Malo 21, cultivated at La Ceja, Colombia, by M. & O. Robledo, flowered in cult. 21 January 1978, C. Luer 2285 (HOLOTYPE: SEL, ISOTYPE: JAUM).

ADDITIONAL MATERIAL EXAMINED: *ECUADOR*: CARCHI: epiphytic in cloud forest along the mountain crest behind Rio Blanco near km 78 from Ibarra to San Lorenzo, alt. 1400 m, 14 Dec. 1961, C. H. Dodson & L. B. Thien 1607 (SEL).

DISTRIBUTION: Northwestern Ecuador.

This species, vegetatively very similar to many other related species, is apparently endemic on the western slopes of the Andes of northern Ecuador. It is characterized by short peduncles that apparently bear only one flower which seems to be autogamous since every flower produces a fruit in cultivation. The white sepals form a well-defined cup dotted with red within, with the free parts widespread with long, slender, maroon tails. The shallow epichile of the lip is acutely deflexed on the hypochile.

Masdevallia figueroae Luer, sp. nov.

Planta mediocris epiphytica caespitosa, caulibus secundariis bene effectis unifoliatis, foliis coriaceis ellipticis subpetiolatis, flore solitario pulchro, pedunculo gracili folio subaequilongo, sepalis albis roseo et purpureo suffusis et guttatis in tubum cylindricum connatis partibus libris triangularibus caudis gracilibus extendentis, petalis oblongis apice lobulatis dimidio inferiore in-crassato verruculoso cum dente basali, labello panduriformi bicalloso apice obtuso callo mediano base anguste fisso.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems well-developed, 4.5-7 cm long, unifoliate, enclosed by a loose, tubular sheath and a shorter one at the base. Leaf erect, coriaceous. elliptical, subpetiolate, 8-11 cm long including the 1-2 cm petiole, 18-25 mm wide, the subacute apex tridenticulate, with prominent secondary veins parallel to either side of the midvein, the base narrowed gradually into the channeled petiole. Inflorescence a solitary, showy flower borne by an erect, slender, terete peduncle 8-9 cm long, with a bract near the base, from a node high on the secondary stem; floral bract tubular, 11 mm long; pedicel 15 mm long; ovary 8 mm long, green with purple dots; sepals white to pink, dotted and suffused with lavender to purple, glabrous externally, minutely verrucose and shortly pubescent within, connate 13-14 mm into a slightly curved, sepaline tube, the free portions spreading, triangular, the acute apices attenuated into slender tails, the dorsal sepal obovate, the purple to orange tail 28 mm long, the total length 47 mm, the width 8 mm, the lateral sepals ovate, oblique, with orange tails 23 mm long, the total length 46 mm, 18 mm wide together; petals white marked with purple, oblong, 6 mm long, 3 mm wide, the apex obtusely bilobed with a small apiculum in the sinus, the labellar half thick, verrucose, ending in a short tooth just above the base; lip pandurate, 6.5 mm long, 3.5 mm wide below the middle, 2.5 mm wide above the middle, pink marked with purple, the apical portion white, obtuse, with a small, median callus, the base retuse, narrowly cleft, hinged beneath, the disc with a pair of thick, longitudinal calli; column semiterete, pink spotted with purple, 5 mm long, the foot 2 mm long with a forwardly directed extension.

ETYMOLOGY: Named in honor of Sr. Luis Figueroa of Loja, Ecuador, co-discover of this species.

TYPE: *ECUADOR*: ZAMORA-CHINCHIPE: epiphytic in cloud forest at Yangana near Valladolid, alt. 2600 m, July 1975, W. Teague, L. Figueroa & D. Welisch s.n., cultivated by O. Arango near Medellin, Colombia, flowered in cult. 24 Jan. 1978, *C. Luer* 2325 (HOLOTYPE: SEL, ISOTYPE: JAUM).

DISTRIBUTION: Southern Ecuador.

Like very few other species in the genus, the peduncle rises from a node well above the base of a comparatively tall secondary stem. A solitary, colorful flower, with a well-developed sepaline tube, is borne at the apex of a slender peduncle. The sepals are whitish but heavily suffused with pink to purple with spreading orange tails. Within, the surfaces are finely mottled with lavender and shortly pubescent. The petals are thick and verrucose on the lower half. The pink, pandurate lip has a blunt, white apex.

Masdevallia fuchsii Luer, sp. nov.

Species haec *M. constrictae* Poepp. & Endl. affinis sed flore minore caudibus sepalorum multibrevioribus, dente base petalorum incurvato et labello integro ligulato notabilis.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, 15-27 mm long, unifoliate, concealed by a loose sheath. Leaf erect, coriaceous, narrowly elliptic-obovate, petiolate, 4.5-11.5 cm long including the petiole 2-4 cm long, 13-17 mm wide, the tridenticulate apex subacute, the base gradually narrowed into the channeled petiole. Inflorescence a solitary flower borne by a slender, suberect peduncle 4-4.5 cm long with a basal bract, from a node on the secondary stem; floral bract tubular, 8 mm long; pedicel 10-12 mm long; ovary green, lightly pitted, 5-6 mm long; sepals glabrous externally, pubescent above the middle internally, white, veined in orange and suffused with bright orange toward the bases, the dorsal sepal obovate, 23 mm long, 10 mm wide when spread, connate with the lateral sepals for 17 mm into a sigmoid, ventricose, sepaline tube with a widely spread stoma, the free portion broadly ovate, the obtuse apex produced into a recurved, yellow tail 10-12 mm long, the lateral sepals obliquely obovate, 20 mm long, connate and narrowed below the middle into the sepaline tube, concave, the free portions broadly ovate, each 9 mm wide, the obtuse apices produced into tails similar to that of the dorsal sepal; petals translucent yellowish white, oblong, 7.5 mm long, 2 mm wide, the apex obliquely subacute, with a longitudinal, thin lamella along the lower margin terminating at the base in a broad, obtuse, inflexed tooth; lip oblong-ligulate, 5 mm long, 2.5 mm wide, white, green toward the subacute apex, purple toward the truncate base, hinged beneath; column light yellow-green with a purple margin, semiterete, 5 mm long, with a short foot and a short, incurved extension.

ETYMOLOGY: Named in honor of Fred J. Fuchs, Jr. of Naranja, Florida, who, along with Janet Kuhn of Easton, Ct., discovered this species.

TYPE: PERU: HUANUCO: epiphytic between Tingo Maria and Pucalpa, alt. 1700 m, March 1975, F. Fuchs, Jr. & J. Kuhn s.n., cultivated at Easton, Ct., flowered in cult. 7 Nov. 1977, *C. Luer* 2113 (HOLOTYPE: SEL).

DISTRIBUTION: Peru.

This species is presently known from only one locality in Peru where it was found growing with *Masdevallia constricta* Poepp. & Endl. Although it is very closely allied to the latter, it maintains its identity well. Vegetatively the two species are essentially identical. The flowers of *M. fuchsii* are about half as large as those of *M. constricta* with much shorter tails (about 1 cm long compared to 3-4.5 cm). The petals of the former are provided with a blunt, inflexed tooth at the base, and the simple lip lacks the lateral angles above the middle.

Masdevallia fuliginosa Luer, sp. nov.

Inter species sectionis *Saccilabiatae* distinguitur floribus parvis, sepalis late ovatis patentibus virescentibus dense et minute fuligineo papillis longicaudatis, petalis bivalvis, labello roseoaureo epichilio transverse ovato profunde concavo intus lamellis radiantibus margine involuto plus minusve dentato.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems channeled, slender, 2-4 cm long, unifoliate, enclosed by 2 loose, tubular sheaths. Leaf erect or suberect, thinly coriaceous, carinate along the midvein on the back, very narrowly obovate, 15-30 cm long, 2.5-4 cm wide, the tridenticulate apex subacute, the base gradually narrowed into the conduplicate petiole. Inflorescence a several-flowered (to 10), congested raceme of successive flowers borne by a horizontal to ascending or descending, sparsely bracted peduncle, from a node low on the secondary stem; floral bract tubular, 1 cm long; pedicel 10-15 mm long; ovary 5-6 mm long; sepals glabrous externally, light green, covered by numerous, minute brownish black papillae within, the dorsal sepal transversely ovate, 13-15 mm long, 16-18 mm wide, connate for 5 mm with the lateral sepals to form a widely spread cup, the obtuse apex shortly acuminate into a black, filiform tail 5-8 cm long, the lateral sepals ovate, oblique, each 17 mm long, 15 mm wide, connate 8 mm to form a shallow mentum, the subacute apices produced into tails similar to that of the dorsal sepal; petals brown, oblong, 3.5 mm long, 2 mm wide, the apex bivalved, papillose between the laminae, the inner lamina acute, the outer lamina rounded; lip pinkish orange, spatulate, 8 mm long, 6 mm wide, the hypochile oblong, 4 mm long, 3.75 mm wide, with erect obtuse, marginal angles, cleft centrally, the base concave and hinged to the column-foot, the epichile transversely ovate, 4.5 mm long, 6 mm wide, deeply concave, the sides involute, with 5-7 radiating lamellae within, producing a more or less denticulate margin; column greenish white, stout, 4.5 mm long with a short, thick foot.

ETYMOLOGY: From the Latin *fuliginosus*, "full of soot" (*fuligo*, "soot"), in allusion to the intense brownish black speckling of the sepals.

TYPE: ECUADOR: PICHINCHA: epiphytic in cloud forest near Mindo west of Quito, alt. ca. 1800 m, July 1975, W. Teague & D. Welisch s.n., cultivated by M. & O. Robledo at La Ceja, Colombia, flowered in cult. 17 Oct. 1977, C. Luer 2104 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

Perhaps most closely related to the *Masdevallia erythrochaete-gaskelliana* complex of Central America and *M. houtteana* Rchb. f. of Colombia, this species occurs locally on the western slopes of the Andes of Ecuador. It may be recognized by its blackish-brown, "sooty" flowers of a similar size. The color is imparted by numerous purplish or brownish black specks covering the sepals, and sometimes arranged in rows along the veins. The sepals are broadly or transversely ovate with long, slender, black tails. The lip is not remarkably different. In fact, it is somewhat variable. The lamellae within the concave epichile may extend to the border to create a denticulate margin, or they may abate short of the edge to leave it entire.

Masdevallia gigas Luer & Andreetta, sp. nov.

Planta grandis epiphytica caespitosa, foliis anguste elongatis caulibus brevibus, pedunculo longo suberecto racemo paucifloro, floribus grandibus successivis, sepalis pallide roseo brunneis longicaudatis cupulam patentem formantibus cum mento obtuso compresso, petalis bivalvatis apice verruculosus, labello spatulato epichilio orbiculari concavo carinulis multis radiantibus.

Plant large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, 3-7 cm long, channeled, mostly enclosed by a somewhat longer, loose sheath and a short 1 or 2 at the base, unifoliate. Leaf erect, thinly coriaceous, narrowly obovate, 15-40 cm long, 2.5-3.5 cm wide, carinate on the back, the apex acute, tridentate, the base gradually narrowed into a conduplicate petiole. Inflorescence a progressively contracted, few-flowered raceme to 20 cm long of large, successive flowers, borne on an ascending, suberect peduncle 20-45 cm long, from a node low on the secondary stem; floral bract 1-2 cm long; pedicel 2-4.5 cm long; ovary 6-7 mm long; sepals light pinkish brown, connate below the middle to form a widely patent sepaline cup, with red-brown tails about 6 cm long, the dorsal sepal broadly ovate 30-35 mm long, 27 mm wide, connate to the lateral sepals for 12 mm, the obtuse apex acuminate into the tail, the lateral sepals ovate, subcarinate externally, each about 40 mm long, 23 mm wide, connate to near the middle to form a deep, obtuse, compressed mentum, the acute apices acuminate into the tails; petals thick, spatulate, white marked with brown, 4 mm long, 2.5 mm wide, carinate externally, bivalved at the rounded apex, with brown verrucosities between the laminae, the inner lamina acute and denticulate; lip pink, spatulate, 10 mm long, 6 mm wide, the hypochile 4 mm long, 3 mm wide, with subacute, erect, marginal angles, shallowly cleft between, the base curved, concave, hinged to the column-foot, the epichile suborbicular, 6 mm long, 6 mm wide, concave with upturned margins, with multiple, radiating lamellae within; column light yellow, stout, 5 mm long, with a foot 3 mm long.

ETYMOLOGY: From the Latin *gigas*, "a mythological giant," in reference to the size of the plant and flowers.

TYPE: *ECUADOR: CARCHI:* epiphytic in cloud forest of the western slopes of the Andes, alt. 1800-2200 m, Oct. 1975, A. Andreetta & A. Hirtz 2, cultivated in Cuenca, flowered in cult. 12 July 1977, *C. Luer 1690* (HOLOTYPE: SEL); same area, 21 Feb. 1978, *C. Luer, J. Luer & A. Hirtz 2681* (SEL).

DISTRIBUTION: Northern Ecuador.

This large, rosy-flowered species is characterized by the elongated, suberect peduncle which often lists with the weight of a flower. The first flower produced on each peduncle is the largest, the subsequent flowers becoming progressively smaller. The dull pinkish brown color is composed of numerous, microscopic, brownish-purple dots on a dull yellow background. Among individual plants of the species, the epichile of the lip is somewhat variable. The degree of concavity and the number of radiating lamellae contained therein are not constant.

Masdevallia hajekii Luer, sp. nov.

Planta mediocris rhizomate ascendenti, caulibus secundariis elongatis gracilibus, foliis coriaceis ellipticis petiolatis, pedunculo pediceloque elongato, flore solitario nitido roseo atropurpureo maculato, cupula sepalorum ringenti, caudis filiformibus albiviridibus, petalis oblongis basi cum dente, labello oblongo-ovato recurvato punctato, pede columnae elongato.

Plant medium in size, epiphytic, caespitose to shortly repent or ascending; roots slender, flexuous. Secondary stems slender, 2.5-4.5 cm long, enclosed by 2 tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical, 6-13 cm long including the petiole, 12-17 mm wide, the apex subacute, tridentate, the base narrowly cuneate into a channeled petiole 2-5 cm long. Inflorescence single-flowered, the peduncle slender, erect, with a bract near the base, from a node on the secondary stem; floral bract tubular, 15-20 mm long; pedicel 35-48 mm long, dotted with purple; ovary 5-7 mm long, green with purple dots; sepals glossy, pink, intensely spotted with dark purple, minutely pubescent near the middle within, the dorsal sepal oblong, 21 mm long, connate to the lateral sepals for 15 mm into a gaping, campaniform sepaline tube, the free portion dilated, triangular, 12 mm wide, the subacute apex produced into a slender, greenish white tail 33 mm long, the total length 53 mm, the lateral sepals oblong, oblique or obscurely sigmoid, about 23 mm long, 13 mm wide, connate to the column-foot for about 9 mm, connate to each other for 12 mm into a deep, subacute mentum, tapered at the subacute apices into deflexed, filiform tails 27 mm long; petals white, spotted with bright purple, oblong, 8.5 mm long, 2-3 mm wide, the apex more or less rounded with an obtuse tooth occupying the lower part, the labellar margin with a longitudinal callus ending in a blunt tooth near the base, the base oblique; lip fleshy, pink spotted with purple, oblong-ovate, recurved, 12 mm long, 5 mm wide spread, narrowed toward the truncate apex with a protruding, thick, yellow-orange callus at the middle, the base truncate, notched, hinged beneath, the disc with a low, thick pair of longitudinal calli; column stout, white flecked with bright purple, 7 mm long, with an equally long foot with a narrow, recurved extension.

ETYMOLOGY: Named in honor of Dr. Carlos Hajek of Cochabamba, Bolivia, who discovered this species.

TYPE: *BOLIVIA*: COCHABAMBA: between Cochabamba and Villa Tunari, alt. ca. 2700 m, Feb. 1973, Janet Kuhn s.n., cultivated in Easton, Ct., flowered in cult. 7 Nov. 1977, *C. Luer 2114* (HOLOTYPE: SEL).

DISTRIBUTION: Bolivia.

This showy species was first discovered by Dr. Hajek about 1965. Plants found more recently by Janet Kuhn have been cultivated by her in Easton, Connecticut. Vegetatively the species is characterized by an elongated secondary stem and a petiolate leaf. The large, shiny, pink flower dappled with large, purple spots and with spreading, white tails looks like a wet, purple-spotted frog leaping from the foliage.

Masdevallia instar Luer & Andreetta, sp. nov.

Masdevalliae xanthinae Rehb. f. et affinitatibus cognata a quibus differt statura grandi, mento sepalorum lateralium prominenti, cornu basi petalorum crasso obtuso et labello elliptico infra apicem truncatum constricto.

Plant medium-sized, epiphytic, caespitose; roots slender, flexuous. Secondary stems terete, 2-4 cm long, unifoliate, clothed by 2 brown, tubular sheaths. Leaf erect, coriaceous, narrowly obovate to elliptical, petiolate,

6-11 cm tall including the 1.5-3 cm petiole, 16-23 mm wide, the subacute apex tridenticulate, the base narrowly cuneate into the slender petiole. Inflorescence a solitary flower borne by an erect, slender peduncle, 6-11 cm long, with a narrow bract near the base, from low on the secondary stem; floral bract close, tubular, 8-14 mm long; pedicel 10-20 mm long; ovary 9-10 mm long; sepals yellow, minutely flecked with red within, with slender red-purple to orange-brown tails 2-5 cm long, connate basally for 4-5 mm into a shallow cup, the dorsal sepal ovate, 14-17 mm long, 11-14 mm wide, subcarinate, the apex obtuse to rounded, abruptly produced into the erect tail, the lateral sepals ovate, oblique, 12-15 mm long, 11-13 mm wide, the apices similarly produced into deflexed tails; petals white, oblong, 6 mm long, 2 mm wide, the truncate apex bilobed with a much smaller lobule in the sinus, with a thick carina along the lower margin terminated at the base in a thick, obtuse, retrorse horn; lip erect, cream, dotted with purple, elliptical, 4.5-5 mm long, 3 mm wide, constricted below the purple, truncate, minimally de-curved apex, with a central callosity; column stout, semiterete, white marked with purple, 4.5 mm long, with a forwardly angled foot 3 mm long, the apex incurved.

ETYMOLOGY: From the Latin *instar*, "a likeness, or an image," in reference to the similarity of the species to others in the section.

TYPE: *ECUADOR*: LOJA: epiphytic in cloud forest on Cajanuma, alt. 2500-2700 m, July 1973, A. Andreetta 4, cultivated in Cuenca, flowered in cult. 12 July 1977, *C. Luer 1691* (HOLOTYPE: SEL, ISOTYPE: QCA).

ADDITIONAL MATERIAL EXAMINED: *PERU*: without locality, R. Stumpfle s.n., cultivated by M. & O. Robledo at La Ceja, Colombia, flowered in cult. Oct. 1977, *C. Luer 1937* (SEL), *R. Escobar 1731* (JAUM).

Although a flowering specimen of this species is easily recognized, it is very similar to many others in the *Masdevallia xanthina* alliance. In habit it resembles most the Venezuelan *M. triangularis* Lindl., but the angles of the junction of the sepals of latter are obtuse, and the lip is widest below the reflexed, denticulate apical lobule. The description of *M. instar*, however, most closely approaches the smaller *M. xanthina* and its host of allies. Most distinctive is the elliptical lip with the constriction just below the truncate apex.

Masdevallia janetiae Luer, sp. nov.

Masdevalliae vespertilionis Rehb. f. affinissimis, sed caudis divergentibus et epichilio labelli transverse elliptico applanato dignoscenda.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems 2-3 cm long, channeled, clothed by 1-2 close-fitting sheaths, unifoliate. Leaf erect, thinly coriaceous, narrowly obovate, carinate dorsally, 8-13 cm long, 15-20 mm wide, the apex acute, tridenticulate, the base gradually tapered into a conduplicate petiole. Inflorescence a few-flowered (2-3), congested raceme of successive flowers borne by a slender, descending, red-purple peduncle 7-10 cm long, from a node low on the secondary stem; floral bract 5-7 cm long; pedicel 8-10 mm long; ovary 4 mm long, 4 mm wide, purple with 6 irregular, green wings; sepals more or less flat and widely spread, glabrous externally, shortly pubescent within, yellowish, irregularly

dotted and spotted with brown-purple, ovate, the subacute apices terminated by diverging, filiform, yellowish tails about 3 cm long, the dorsal sepal 14 mm long, 11 mm wide, connate to the lateral sepals for 3-4 mm; the lateral sepals 15 mm long, 15 mm wide, connate for 14 mm; petals oblong-ligulate, 5 mm long, 2 mm wide, light to dark yellow marked with purple, the rounded apex bivalved with purple papillae between the laminae; lip white, fleshy, spatulate, 6.5 mm long, 6 mm wide, the hypochile thick, deflexed, 4 mm long, 3.5 mm wide, with elevated, rounded margins, cleft centrally, extending forward as a minutely papillose callus, the epichile transversely elliptical to suborbicular, 4 mm long, 6 mm wide, flat to minimally concave, covered with minute, pink verrucae; column stout, ivory, 4.5 mm long, with a thick foot.

ETYMOLOGY: Named in honor of Janet Kuhn of Easton, Ct., who discovered this species.

TYPE: PERU: HUANUCO: epiphytic between Tingo Maria and Pucalpa, alt. ca. 1700 m, March 1975, Janet Kuhn s.n., cultivated at Easton, Ct., flowered in cult., 9 Nov. 1977, *C. Luer 2137* (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Peru.

Masdevallia janetiae is the first chimaeroid species to be discovered in Peru, hence by far the most southernly distributed species of the section. Superficially, it is very similar to *M. vespertilio* Rchb. f., but it is immediately distinguished from the latter by the lip. Instead of a shell-shaped epichile with broad, rounded, incurved, lateral margins and completely smooth within, the epichile of *M. janetiae* is more or less rounded and flat, and studded with minute, pink verrucosities. The flowers of both species are relatively small to medium-sized for the section; they are of similar shape except that the tails of *M. janetiae* are more divergent; and the sepals of both are more or less flat, shortly pubescent, yellowish and irregularly marked with minute and somewhat larger confluent spots of brownish purple.

Masdevallia kuhnorum Luer, sp. nov.

Species haec ab *M. bicolor* Poepp. & Endl. et affinitatibus differt pedunculo quam foliis brevior, sepalis in cupulam sepalorum alte connatis, synsepalo verrucoso late ovato caudis brevibus et labello late oblongo.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, abbreviated, 1-2 cm long, enclosed by 2-3 short, basal sheaths, unifoliate. Leaf erect, fleshy, coriaceous, narrowly obovate, subpetiolate, 9-16 cm long, 15-28 mm wide, obtuse to rounded at the apex, tridenticulate, the base gradually narrowed into an indistinct, channeled petiole. Inflorescence a congested, few-flowered (3-5) raceme of successive flowers, at the apex of a stout, suberect, triquetrous peduncle 8-11 cm long, with a bract at the base, from a node low on a secondary stem; floral bracts imbricating, papery, ca. 8 mm long; pedicel 5 mm long; ovary 4 mm long; dorsal sepal pale green, connate with the lateral sepals for 10-11 mm into a broad, cylindrical, sepaline tube, oblong-obovate, the free portion broadly triangular, acuminate into a thick, erect tail, the total length 36-42 mm, width 6-8 mm; lateral sepals maroon, greenish along the veins, verrucose within, connate ca. 2 cm into a broadly ovate synsepal 29-40 mm long, 15-20 mm wide,

with a broad, shallow mentum, the free, acuminate, acute apices green or maroon, 6-10 mm long; petals white, dotted with purple, oblong-ovate, 8 mm long, 3.5 mm wide, the apex tridentate, minutely papillose, with a longitudinal callus above the lower margin, terminating in a rounded prominence above the dilated base; lip yellow, dotted with red-brown, broadly oblong, 8 mm long, 4.5 mm wide, with a diagonal pair of marginal folds above the middle, ovate above the folds, the apex obtuse, papillose, the base subtruncate, shortly hinged beneath; column semiterete, green, edged in purple, 6 mm long, the foot spotted, 4 mm long.

ETYMOLOGY: Named in honor of Janet and Lee Kuhn of J & L Orchids, Easton, Ct., whose successful cultivation of this species and many others has so greatly contributed to the investigation of the genus.

TYPE: PERU: HUANUCO: epiphytic between Tingo Maria and Pucalpa, alt. ca. 1100 m, March 1975, Janet Kuhn s.n., cultivated in Easton, Ct., flowered in cult., 8 Nov. 1977, *C. Luer 2130* (HOLOTYPE: SEL).

DISTRIBUTION: Peru.

The flowers of this species are somewhat variable in size and color. Both dorsal and lateral sepals of some specimens are intensely suffused with purple, others are mostly green. The length of the tails of the lateral sepals is also variable, but short, nevertheless. The sepaline tube is deep, the synsepal is verrucose, the petals are furnished with a bulbous callus above the base, and the lip is broadly oblong.

***Masdevallia limax* Luer, sp. nov.**

Ab *M. ventricularia* Rchb. f. et affinibus distinguitur tubo sepalorum aurantiaco lato nutanti supra medium deflexo stomate cucullato, petalis obliquis apice tridentatis base cum dente obliquo inflexo et labello ovato canaliculato supra medium anguste oblongo obtuso.

Plant small, epiphytic, caespitose; roots fine, flexuous. Secondary stems slender, 10-15 mm long, clothed by a loose, tubular sheath, unifoliate. Leaf erect, coriaceous, petiolate, elliptical, 5-7.5 cm long, including the 1.5-2.5 cm long petiole, 11-15 mm wide, the apex acute, tridenticulate, the base cuneate into the petiole. Inflorescence a solitary, nodding, tubular, bright orange flower borne by a slender, erect peduncle 3-4 cm long, with a basal bract, from the base of the secondary stem; floral bract tubular, 3-4 mm long; pedicel 4-5 cm long; ovary 3 mm long; sepals glabrous except for the free portions pubescent within, the dorsal sepal connate for 13 mm to the lateral sepals which are connate to each other for 9 mm to form a broad, ventricose tube, somewhat bent forward above the middle to form a hooded stoma, the dorsal sepal oblong, curved, concave, carinate, 16 mm long, 4 mm wide, the free portion broadly ovate, obtuse, produced into a straight 7 mm long tail, the lateral sepals concave-ventricose at the middle, 13 mm long, 11 mm broad together and spread out, the free portions broadly ovate, oblique, produced into tails similar to that of the dorsal sepal; petals light orange, oblong, oblique, 6 mm long, 1.5 mm wide, the apex truncate, tridentate, with a longitudinal carina along the lower margin ending in a thickened, inflexed process at the extreme of the oblique base; lip orange, ovate, 5.5 mm long, 2.5 mm wide, narrowed above the middle with deflexed margins, the apex

narrowly oblong, obtuse, the disc broadly and shallowly channeled, the base subcordate, hinged beneath; column semiterete, greenish white, 4 mm long, the foot 2 mm long with an incurved extension.

ETYMOLOGY: From the Latin *limax*, "a slug" in allusion to the appearance of the flower.

TYPE: *ECUADOR*: TUNGURAHUA: epiphytic in a tree on the slopes of the Rio Pastaza near Baños, alt. 2000 m, 1974, A. Andreetta s.n., cultivated near Cuenca by B. Malo, flowered in cult. 5 Feb. 1978, *C. Luer* 2472 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This very distinct species is known from a single collection by Padre Andreetta in an area presumably fairly well known botanically. The little, orange, sepaline tubes are bent forward above the middle so that the opening of the flower, surrounded by the three short tails, faces more or less downward. The tails of the lateral sepals resemble stalked eyes emerging from the head of a slug as the fat, shell-less body perches upon the stem of a freshly devoured flower.

Masdevallia lotax Luer, sp. nov.

Masdevalliae velutinae Rchb. f. similis, sed foliis parvis angustissimis, flore albo parvo cum cupula sepalorum suborbiculari bene effecta, pubescentia carnosa, caudis filiformibus quam sepalis duplo- vel triplolongioribus, petalis bivalvatis et labello carnoso deflexo suboblongo epichilio parvissimo in duo partes concavas divisio notabilis.

Plant small, epiphytic, forming dense, caespitose masses; primary stem shortly creeping, producing a secondary stem every 3-5 mm; roots fine, flexuous. Secondary stems abbreviated, 1-2 cm long, concealed by a short, thin, tubular sheath, unifoliate. Leaf erect, coriaceous, linear to very narrowly obovate, sulcate, carinate on the back, acute, tridenticulate, 6-10.5 cm long, 4-6 mm wide. Inflorescence a single flower produced by a slender, horizontal or descending peduncle 5-8 cm long, from a node low on the secondary stem; floral bract 5-6 mm long; pedicel 6-12 mm long; ovary 3-4 mm long, with low, undulating carinae, green on rose; sepals united to near the middle into a gaping, suborbicular, sepaline cup, white, glabrous externally, densely beset by short, pointed papillae or thick hairs within, dotted with pink to orange near the bases, the apices produced abruptly into maroon, filiform tails about 2.5 cm long, the dorsal sepal united to the lateral sepals for 5 mm, transversely ovate, the apex rounded, 8 mm long, 11 mm wide, the lateral sepals connate for 8 mm into a broad, concave synsepal, suffused with brown centrally toward the base, each broadly ovate, obtuse, 10 mm long, 9 mm wide; petals white marked with purple, oblong-ligulate, 4 mm long, 1.5 mm wide, the rounded apex bivalved with papillae between the laminae; lip fleshy, white speckled with pink, more or less oblong, thickened and broadened near the middle, 4.5-5 mm long, 3 mm wide, the hypochile deflexed, concave and curved at the base, with obtuse lateral angles flanking the thickened, broadly sulcate central portion, the epichile 1.5 mm long, 2.5 mm wide, transversely elliptical, concave, with thickened margins, divided into 2 small concavities by a central keel; column stout, white, 3 mm long, with a foot nearly as long.

ETYMOLOGY: From the Greek *lotax*, "a buffoon or clown," in allusion to the fancied face seen in the flower.

TYPE: *ECUADOR*: PASTAZA: epiphytic in rain forest near Mera, west of Puyo, alt. 1000 m, April 1973, Janet & LeRoy Kuhn & J. Brenner s.n., cultivated at Easton, Ct., flowered in cult., 7 Nov. 1977, *C. Luer 2120* (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

ADDITIONAL MATERIAL EXAMINED: *ECUADOR*: PASTAZA: same area as above, cultivated at Puyo, flowered in cult., March 1976, *Joe Brenner 16* (SEL).

The free-flowering "clown," as it has become affectionately known since it was first found, is distinguished by the dense clump of small, very narrow leaves. The solitary, white flowers are produced frequently on little, horizontal peduncles. The sepals form a distinct cup which is lined by a blanket of short, thick hairs. The dark-tipped petals flank the column like beady eyes to either side of a nose, and the lip below is easily interpreted as a mouth, all in the center of a whiskery face.

Masdevallia maloi Luer, sp. nov.

Planta grandis epiphytica caespitosa, caulibus secundariis semi-teretibus supra canaliculatis unifoliatis, foliis erectis rigidis linearibus acutis base conduplicatis, flore solitario grandi, pedunculo pedicelloque subaequilongo folio dimidio, sepalis crassis rigidis strictis expansis flavis extus purpureo punctatis apicibus anguste acuminatis, cupulo sepalorum cylindrico, petalis ellipticis apice rotundatis leviter bicallosis, labello oblongo punctato apice obtuso papilloso.

Plant large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, semi-terete below, channeled above 6-8 cm long, unifoliate, enclosed by a loose, whitish, papery sheath, and another 1-2 shorter ones at the base. Leaf erect, linear, thick, rigid, coriaceous, tridenticulate at the acute apex, the base subpetiolate, conduplicate, 21-30 cm long, 17-22 mm wide. Inflorescence a large, solitary flower borne on a terete peduncle, green with small purple spots, 4-13 cm long, from near the base of a secondary stem; floral bract tubular, speckled with purple, 1.5-2 cm long; pedicel similarly speckled, 6-7 cm long; ovary dotted with purple, 1 cm long; sepals fleshy, rigid, straight, yellowish, subverrucose within, with minute, brown-purple spots externally, the dorsal sepal united to the lateral sepals for 10 mm into a cylindrical sepaline cup, the free portion narrowly triangular, erect, the apex attenuated into a narrow, semiterete tail, total length 6-9 cm, width 13 mm, the lateral sepals connate for 8 mm, ovate, oblique, spreading, attenuated into tails similar to the dorsal sepal, total length 6-8 cm, each 12 mm wide; petals white suffused with purple, elliptical, rounded at the apex, with a low, smooth, oval callus along the labellar margin and a similar, smaller callus on the opposite half, 9.5 mm long, 4 mm wide; lip oblong, cream with multiple, raised, purple spots, the apex obtuse, papillose, the margins undulate, the base truncate, narrowly hinged below, 11 mm long, 4-5 mm wide; column yellowish white, terete, 8 mm long, with a stout foot.

ETYMOLOGY: Named in honor of Dr. Benigno Malo y Vega of Cuenca, Ecuador, who discovered this species.

TYPE: *ECUADOR*: LOJA: Cordillera de Sabanilla in the south of the province, alt. 2900 m, September 1973, B. Malo 18, cultivated in Cuenca, flowered in cult., 11 July 1977, *C. Luer* 1685 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This remarkable species is related to *Masdevallia fractiflexa* Lehm. & Krzl. Vegetatively *Masdevallia maloi* is a considerably larger plant. The long, narrowly linear leaves are curved and more or less conduplicate. The fleshy flower is also larger, the sepaline cup is smaller and cylindrical without a mentum, and the spreading, rigid tails are straight, not at all reflexed. The apex of the petal is rounded instead of acute, and the apex of the lip is obtuse instead of obscurely three-lobed.

Masdevallia mentosa Luer, sp. nov.

Planta pusilla epiphytica caespitosa, caulibus secundariis abbreviatis unifoliatis, foliis crassis ellipticis subacutis subpetiolatis, pedunculo gracili triquetro folio duplosuperanti, racemo contracto paucifloro, floribus successivis carnosus viridibus purpureo maculosis, sepalis libris acutis, sepalis laterali-bus basi connatis et cum pede columnae mentum profundum formantibus, petalis oblongis obliquis obtusis basi callo rotundato, labello elliptico apice rotundato rubro punctato.

Plant very small, epiphytic, caespitose; roots slender, flexuous. Secondary stems abbreviated, 2-3 mm long, unifoliate, with 2-3 short, thin, tubular sheaths. Leaf erect, thick, coriaceous, elliptical, subacute at the tridenticulate apex, the base cuneate, subpetiolate, 2-3 cm long, 8-9 mm wide. Inflorescence a contracted, few-flowered (2-3) raceme of successive flowers at the apex of a slender, triquetrous peduncle, 4.5-5.5 cm long, ascending from low on the secondary stem; floral bracts imbricating, 4-5 mm long; pedicel 4-5 mm long; ovary green, 2 mm long; sepals not widely spread, fleshy, green, marked with purple, the dorsal sepal ovate, acute, united to the lateral sepals for 2 mm, 11 mm long, 4.5 mm wide, the lateral sepals triangular, acute, united at the base for about 2 mm, and forming with the column-foot a deep mentum, each 11 mm long, 5 mm wide, with a short, sparse, red pubescence within toward the base; petals pale yellow-green, narrowly oblong, oblique, the apex obliquely lobed, dilated near the base on the labellar margin, overlaid by a rounded callus, 6 mm long, 2 mm wide; lip elliptical, rounded at the apex, the margin more or less erect toward the retuse base, hinged beneath, yellow, irregularly spotted with red, 8 mm long, 3.5 mm wide; column terete, 4.5 mm long, with a foot 4 mm long with an incurved extension.

ETYMOLOGY: From the Latin *mentosus*, "provided with a chin," in reference to the prominent mentum of the flower.

TYPE: *ECUADOR*: PASTAZA: epiphytic in rain forest 20 km east of Puyo, alt. ca. 600 m, 3 Aug. 1977, *C. Luer*, *J. Luer* & *J. Brenner* 1814 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

Only a single plant of this little species was found by Joe Brenner among the branches of a felled rain-forest tree. Vegetatively the small tufted plant is not remarkable. The peduncle, void of any bract, is slender and

sharply three-angled. The comparatively large, fleshy, green flowers marked with purple do not spread widely. The most marked feature of the flower is the deep mentum formed by a 4 mm long column-foot and the bases of the lateral sepals. The apices of the essentially free sepals are acute without tails.

Masdevallia microsiphon Luer, sp. nov.

Species haec *M. delphinae* Luer affinis sed statura multiminore et tubo sepalorum albo brevipedicellato caudis crassissimis latissimis brevissimis notabilis.

Plant very small, epiphytic, caespitose; roots fine, flexuous. Secondary stems slender, 6-8 mm long, unifoliate, enclosed by 1-2 thin, tubular sheaths. Leaf suberect, coriaceous, narrowly obovate, 3-3.5 cm long, 5-6 mm wide, the obtuse apex tridenticulate, the base gradually narrowed into a slender petiole about 1 cm long. Inflorescence an erect, distantly few-flowered (3-5) raceme of minute, simultaneous, tubular flowers, borne by a filiform peduncle, up to 12 cm long including the rachis, from a node low on the secondary stem; floral bract thin, translucent, 2 mm long; pedicel and ovary each 1.5 mm long; sepals greenish white, forming an arched, cylindrical, sepaline tube, 4-5 mm long, with broad, thick, obtuse, yellow tails 1-1.5 mm long, the dorsal sepal obovate-oblong, concave, 6 mm long, 2.5 mm wide, connate to the lateral sepals for 4.5 mm, the free portion broadly obtuse, the lateral sepals connate 2.5 mm into an oblong, bifid lamina, 5.5 mm long including the tails, 3 mm wide, forming an obtuse mentum with the column-foot; petals translucent white, linear-oblong, 1.5 mm long, 0.3 mm wide, the truncate apex more or less retuse, with a thin, longitudinal callus along the labellar margin; lip yellow, oblong, 2.5 mm long, 1.25 mm wide, the apex rounded, the base subcordate and channeled to the middle, with a pair of obtuse, angled, marginal calli above the middle; column greenish white, semiterete, 2 mm long with a foot 1 mm long.

ETYMOLOGY: From the Greek *mikros*, "small," and *siphon*, "tube," in reference to the minute sepaline tube.

TYPE: ECUADOR: LOJA: western slopes of the cordillera, alt. 2000 m, Dec. 1974, B. Malo s.n., cultivated near Cuenca, flowered in cult. 16 July 1977, C. Luer 1719 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This very small, very non-orchidaceous-appearing species has little to recommend it to hobbyists save for its claim to membership in the regal genus *Masdevallia*. From a few weak, little leaves, the hair-like flower stalk bears a few, distant, minute, tubular flowers, colorless except for the blunt, yellowish apices produced into thick, stunted tails.

Masdevallia morenoi Luer, sp. nov.

Planta parva epiphytica caespitosa, caulibus secundariis brevibus unifoliatis, foliis coriaceis anguste ellipticis sensim subpetiolatis, flore solitario pallido flavovirenti, pedunculo tereti folio duplolongiore, sepalis tenuibus caudis gracilibus brevibus divergentibus, cupulo sepalorum brevi, petalis spatu-

latis obliquis acutis cum angulo margine inferiore incrassato, labello rubro punctato elliptico obscure trilobato, lobis lateralibus late rotundatis, lobo antico anguste obtuso, disco incrassato bicarinato.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems short, terete, 4-7 mm long, enclosed by 2 thin, tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical, 2-3.5 cm long, 5-6 mm wide, tridenticulate at the subacute apex, gradually narrowed to a subpetiolate base. Inflorescence a solitary flower borne by a slender, terete peduncle, 7-8 cm long, from low on the secondary stem; floral bract thin, transparent, 3 mm long; pedicel 3.5 mm long; ovary with low, undulate wings, 3-4 mm long; sepals thin, pale yellow-green, glabrous, minutely dotted with purple within especially along the veins, with diverging tails less than 1 cm long, the dorsal sepal united to the lateral sepals for 4 mm into a short, open cup, the free portion triangular, the apex acuminate into a slender tail, total length 17 mm, width 4 mm, the lateral sepals connate for about 3 mm, ovate, oblique, the apices produced into tails similar to the dorsal sepal, total length 11 mm, 9 mm wide together; petals greenish white, obovate-spatulate, oblique, 3.5 mm long, 1.5 mm wide, apiculate at the acute apex, the claw linear, with a thickened, obtuse angle near the middle of the labellar margin; lip pale yellow-green with red dots, elliptical, 4.25 mm long, 2.25 mm wide, obscurely 3-lobed, the lateral lobes near the middle, thin, broadly rounded, the apex narrow, obtuse, the base truncate, hinged below a short sinus, the disc thickened into a pair of low carinae above the middle; column terete, the lower margin edged in purple, 3 mm long, with a short foot.

ETYMOLOGY: Named in honor of Dr. Luis Moreno of Santa Cruz, Bolivia, who discovered this species.

TYPE: *BOLIVIA*: SANTA CRUZ: north of Caranda ca. 25 km SW of Buena Vista, alt. ca. 450 m, July 1975, L. Morneo s.n., cultivated by E. Marshall, Orlando, Florida, flowered in cult., 26 April 1977, *C. Luer 1606* (HOLOTYPE: SEL).

DISTRIBUTION: Bolivia.

This little species, apparently without close affinities, may be recognized by the small, solitary, greenish flower borne by a thin, erect peduncle which tops the clump of leaves by more than twice the height. The oblique, unguiculate petals are thickly angled at the lower margin, and the lip is provided with thin, broadly rounded, lateral lobes.

Masdevallia norops Luer & Andreetta, sp. nov.

Planta mediocris epiphytica caespitosa, caulibus secundariis unifoliatis, folio coriaceo anguste elliptico subacuto longipedicellato, flore solitario fulgenti, pedunculo gracili folio subaequilongo, sepalis flavis aureo suffusis minute pubescentibus caudis gracilibus viridibus, sepalo dorsali elliptico canaliculato, sepalis lateralibus falcatis concavis, petalis oblongis cum dente basali parvo, labello oblongo acuminato pubescenti.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems blackish, slender, 2-4 cm long, unifoliate, enclosed by 2 tubular sheaths. Leaf erect, coriaceous, long-petiolate, narrowly elliptical-obo-

vate, 9-16 cm long including the 3.5-7 cm petiole, 16-24 mm wide, the tridenticulate apex subacute, the base cuneate into the slender, channeled petiole. Inflorescence a solitary, colorful flower produced by an erect, slender peduncle 6-10 cm long, with a bract below the middle, from a node low on the secondary stem; floral bract 12-14 mm long; pedicel 20-22 mm long; ovary dark-brown, pitted, 7-10 mm long; sepals light yellow suffused with bright orange, the margins minutely cilio-erose, the laminae pubescent above the middle, the acute apices acuminate into slender, green tails 3-4 cm long, the blade of the dorsal sepal deflexed, elliptical, concave, channeled, 17-18 mm long, 11 mm wide, connate 5 mm with the lateral sepals to form a shallow cup, the total length 47-50 mm, the lateral sepals strongly falcate, each 40 mm long, 5-6 mm wide, connate 5 mm to form a mentum that accommodates the apex of the lip, the lateral margins incurved, the attenuate tails crossing; petals yellow, oblong, 7.5 mm long, 3 mm wide, the apex oblique, subacute, with a small apical lobule, the lower half with a longitudinal callus ending in a subacute, retrorse tooth at the base; lip orange, oblong, 7 mm long, 3 mm wide, the apex shortly acuminate, acute, minutely pubescent above the middle, with a pair of low, parallel calli, the base truncate, hinged to the column-foot; column light yellow, semiterete, 5.5 mm long, with a foot 3 mm long.

ETYMOLOGY: From the Greek *norops*, "bright, gleaming," in allusion to the bright yellow and orange flowers.

TYPE: ECUADOR: NAPO: epiphytic in Quichos Valley near Rio Solada, alt. ca. 1500 m, Jan. 1976, A. Andreetta & A. Hirtz 11, cultivated in Cuenca, flowered in cult., *C. Luer 2469* (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

Apparently without close relatives, this species is easily recognized by its single, bright yellow and orange flower. The dorsal sepal folds forward with an erect green tail. The markedly falcate lateral sepals with incurved margins form a prominent mentum which is filled by the reclining, minutely pubescent lip. The green tails of the lateral sepals commonly cross below.

Masdevallia odontopetala Luer, sp. nov.

Inter species sectionis *Alaticaulium* Krzl. *M. carruthersianae* Lehm. ex Krzl. et affinitatibus similis sed petalis basibus longidentatis et labello arcuato ab eis recedens.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems channeled, 1-2 cm long, unifoliate, enclosed by 1-2 close, tubular sheaths. Leaf erect, coriaceous, narrowly elliptical, shortly petiolate, 7-10.5 cm long including the 1-2 cm long petiole, 12-18 mm wide, the subacute apex tridenticulate, the base cuneate into the channeled petiole. Inflorescence a congested, several-flowered (to 8) raceme of successive flowers borne at the apex of an erect, triquetrous peduncle, 26-27 cm long, subtended by a tubular bract, from the base of a secondary stem; floral bract tubular, 15-18 mm long; pedicel 18-20 mm long; ovary 5 mm long; dorsal sepal yellow, mottled with purple and shortly pubescent within, ovate, 9 mm long, 8 mm wide, connate to the lateral sepals for 3-4 mm in a revolute margin to form a shallow sepaline cup, the subacute apex produced into an erect, fili-

form, yellow-orange tail 5 cm long; lateral sepals maroon, ovate, oblique, 17 mm long, 17 mm wide together, connate for 7 mm forming an acute, deep mentum in front of the column-foot, the acute apices prolonged into recurved, filiform, yellow tails 3.5 cm long; petals white, elliptical, 4 mm long, 1.75 mm wide, the apex obtusely bidentate, with a broadly rounded laminate wing overlying the lower margin and extended into a long, narrow, deflexed tooth at the base; lip white, densely spotted with purple, ovate, arcuate, 5.5 mm long, 2.25 mm wide, narrowed above a pair of obtuse lateral folds at the middle, the apex obtuse, finely papillose, the base truncate, hinged beneath; column green, semiterete, 4 mm long, the foot equally long, with an incurved extension.

ETYMOLOGY: From the Greek *odon*, "tooth," and *petalum*, "petal," in reference to the toothed petals.

TYPE: *ECUADOR*: MORONA-SANTIAGO: epiphytic on the eastern slopes of the Andes near Chiquinda, alt. 1800 m, 1975, B. Malo s.n., cultivated near Cuenca, flowered in cult. 13 Feb. 1978, C. Luer 2564 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

Although superficially similar to *Masdevallia auropurpurea* Rchb. f. and to *M. carruthersiana* Lehm. ex Krzl. with which it is sympatric, this species is easily identified by the long-toothed process at the base of the petal, an unusual adaptation in the *Alaticaulis* section. In addition, the arcuate lip fits into a small but deep mentum.

Masdevallia ortalis Luer, sp. nov.

A *Masdevallia wageneriana* Lindl. ex Lindl. & Paxt. foliis multimajoribus, margine inferiore petalorum cum dentibus duo et alis labelli obtusis supra medium acuminatis denticulatis dignoscenda.

Plant small, epiphytic, caespitose; roots fine, flexuous. Secondary stems terete, 1.5-2.5 cm long, blackish, unifoliate, clothed by 1-2 thin, tubular sheaths. Leaf erect, coriaceous, dark green, mottled with purple beneath, petiolate, elliptical, 3.5-7.5 cm long including the blackish petiole 1-1.5 cm long, 13-16 mm wide, the subacute apex tridenticulate, the base cuneate into the petiole. Inflorescence a solitary flower borne by an erect, slender peduncle ca. 4 cm long, with a basal bract, from low on the secondary stem; floral bract tubular 8-10 mm long; pedicel 13 mm long; ovary blackish, 5 mm long; dorsal sepal yellow marked with purple along the veins toward the base, transversely oblong, concave, 11 mm long, 14 mm wide, connate to the lateral sepals for 5-6 mm to form a shallow, gaping cup, the free portion broadly rounded, callously thickened at the apex, abruptly produced into an erect, yellow-green tail 25 mm long; lateral sepals colored similarly to the dorsal sepal, microscopically pubescent within above the middle, connate 8 mm into a transversely oblong lamina, 12 mm long, 21 mm wide, the broadly obtuse apices produced into 20 mm long, descending tails similar to that of the dorsal sepal; petals white marked with purple, oblong, 4 mm long, 1.5 mm wide, the truncate apex tridentate, the lower margin overlaid near the middle by an acute, retrorse, triangular tooth, and provided at the base by a smaller, narrower tooth; lip oscillating, yellow mottled with purple, more or less oblong, 3.75 mm long, 2 mm wide, with thin, broadly obtuse, lateral

wings, minutely denticulate below the middle, acuminate above the middle, the narrowed apical portion reflexed with a central callus, the base rounded and concave below with revolute margins, delicately hinged within to the column-foot; column thick, semiterete, yellow with red-purple flecks, the foot 2 mm long with a filamentous extension.

ETYMOLOGY: From the Greek *ortalis*, "a young bird, a chick," in fancied allusion to the resemblance of the flower to a hungry nestling.

TYPE: *ECUADOR*: without locality or collector, purchased by J & L Orchids and cultivated at Easton, Ct., flowered in cult. Nov. 1977, *C. Luer* 2192 (HOLOTYPE: SEL).

DISTRIBUTION: Ecuador.

Vegetatively this species is the largest of the *Masdevallia wagneriana* alliance, the flowers being surpassed slightly in size by those of *M. rodolfoi* (Braas) Luer. The comparatively large leaves are diffusely marked with purple beneath. The flower is most similar to the much smaller *M. wagneriana* of Venezuela, but the details of the petals and lip readily distinguish it. The marginal callus of the petals of *M. ortalis* is developed into a deflexed, triangular tooth near the middle and a smaller one at the base. The wings of the lip are obtuse with an acuminate margin above the middle instead of broadly rounded and denticulate.

Masdevallia ova-avis Luer, sp. nov.

Habitu *M. polystictae* Rehb. f. et affinibus similis, sed racemo brevi contrato disticho horizontali, pedunculo longo, floribus aggregatis glabris nitidis griseis purpureo punctatis caulibus gracilibus aureis deflexis, sepalo dorsali cucullato, sepalis lateralibus oblongis basi connatis, petalis serrulatis apiculatis, et labello subpandurato obtuso differt.

Plant medium in size, but large for the section, terrestrial to epiphytic, caespitose; roots slender, flexuous. Secondary stems terete, 3-5 cm long, concealed by 2-3 brown, tubular sheaths, unifoliate. Leaf erect, coriaceous, elliptical-oblong, tridenticulate at the subacute apex, the base cuneate into a well-defined, sulcate petiole, 4-8 cm long, total length 15-21 cm, 3-4.5 cm wide. Inflorescence a compact, horizontal, distichous raceme 2-3 cm long, of 6-9 simultaneous, glabrous, shiny, pearly-gray flowers speckled with purple, with slender, deflexed, yellow-orange tails; peduncle slender, suberect, 15-23 cm long, from a node on the secondary stem; floral bract cucullate, acute, 5 mm long; pedicel 2.5 mm long; ovary 2.5 mm long with undulate wings; dorsal sepal united to the lateral sepals for 6 mm, ovate, cucullate, the apex rounded, abruptly caudate, the tail 14-16 mm long, the lamina 14 mm long, 10 mm wide; lateral sepals oblong, connate at the base to form a mentum below the column-foot, each narrowed at the apex into a tail 10-15 mm long, the lamina 11 mm long, 5 mm wide, with a yellow stripe down the purple center; petals dull white dotted with purple, elliptical-oblong, the margins serrulate, the apex obtuse with a short, acute apiculum, with a low, longitudinal lamella above the labellar margin, 5 mm long, 2.25 mm wide; lip oblong-subpanduriform, rounded at the apex, truncate at the base, lightly channeled centrally between thickened folds above the middle, orange-

brown dotted with purple, 5 mm long, 2.5 mm wide; column greenish white with purple flecks, semi-terete, 4 mm long, with a foot 3 mm long.

ETYMOLOGY: From the Latin *ova avis*, "eggs of a bird," in allusion to the appearance of the crowded inflorescence of speckled, ovoid flowers.

TYPE: *ECUADOR*: PICHINCHA: terrestrial and epiphytic along the new road between Quito and Santo Domingo, alt. 2000 m, 1974, B. Malo s.n., cultivated in Cuenca, flowered in cult., 20 July 1977, C. Luer 1753 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This distinctive species of the *Polystictae* section is slightly larger than the orange-flowered *Masdevallia lehmannii* Rchb. f. to which it seems most closely related. Both species bear a congested, several-flowered raceme in a horizontal plane at the apex of a long, slender peduncle. Crowded more or less into a circle around the short rachis, the light bluish, ovoid sepaline cups speckled with purple resemble a clutch of bird eggs. The nest beneath is represented by the skirt of deflexed, orangish tails.

Masdevallia densiflora Schltr. from Colombia and some forms of *M. polysticta* have similarly densely flowered racemes.

Masdevallia pantex Luer, sp. nov.

Haec species *M. triaristellae* Rchb. f. et affinibus similis, sed floribus cum cupula sepalorum ampla, sepalis lateralibus supra medium convexis caudis brevibusque, et labello cum carinis dentatis differt.

Plant very small, epiphytic, caespitose; roots fine, flexuous. Secondary stems abbreviated, 2-3 mm long, concealed by a short, thin, ribbed sheath, unifoliate. Leaf thick, linear to very narrowly obovate, semiterete and channeled below, dark green, mottled with purple on the back, 2-3 cm long, 2-3 mm wide. Inflorescence a contracted, few-flowered raceme of successive flowers; peduncle lightly verrucose, erect or ascending from a node on the secondary stem, about 3 cm long; floral bract tubular, 2-3 mm long; pedicel 3-5 mm long; ovary lightly verrucose, 1.5 mm long; dorsal sepal connate to the synsepal for 3.5 mm to form a widely patent, saccate, sepaline cup, the dorsal sepal concave, transversely cuneate, 4 mm long, 6 mm wide, dark purple, the free margin yellow and minutely ciliate, broadly obtuse, abruptly produced into an erect, yellow tail 7 mm long, the lateral sepals purple, connate 7 mm into an oblong synsepal, deeply concave below the middle, convex above the middle, 9 mm long, 7 mm broad, the apex broadly rounded, produced abruptly into short, 3 mm long, yellow tails from the lateral margins about 3 mm from the middle of the synsepal; petals membranous, oblong, the apex more or less truncate, erose and apiculate, 3 mm long, 1 mm wide, translucent yellow with a purple spot; lip deep rose, ovate, 3 mm long, 1.5 mm wide, the apex narrowly obtuse, the base sagittate, cleft to accommodate the column-foot, the disc convex immediately before the junction with the column-foot, flanked by a pair of bluntly toothed carinae; column slender, greenish white suffused with pink, 3 mm long, with a laterally compressed foot 1.5 mm long.

ETYMOLOGY: From the Latin *pantex*, "a paunch," in allusion to the protruding, belly-like lateral sepals.

TYPE: *ECUADOR*: ZAMORA-CHINCHIPE: epiphytic in cloud forest at Yangana near Valladolid, alt. 2600 m, July 1975, W. Teague, L. Figueroa & D. Welisch s.n., cultivated by M. & O. Robledo at La Ceja, Colombia, flowered in cult. 27 Sept. 1977, *C. Luer 1854* (HOLOTYPE: SEL, ISOTYPE: JAUM).

DISTRIBUTION: Southern Ecuador.

Masdevallia pantex is one of the most distinctive members of the section *Triaristellae*. The sepals are broad, forming a wide, open cup with the concave synsepal protruding behind. Below the middle the synsepal bulges forward conspicuously, and two short tails are produced from the sides near the rounded apex. The low lamellae of the lip are provided with a few distinct teeth.

***Masdevallia patriciana* Luer, sp. nov.**

Habitu *M. nidifica* Rehb. f. similis, sed statura minore, ovario non-cristato, flore polychromo, cupula sepalorum suborbiculari ventricosa, caudis sepalorum filiformibus, petalis tridenticulatis base cum dente prominenti, labello integro ligulato acuto differt.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems abbreviated, 4-6 mm long, concealed by a loose, tubular sheath, unifoliate. Leaf erect, coriaceous, obovate, obtuse, tridenticulate, the base cuneate into a petiole 1-2 cm long, with the secondary stem becoming black with age, total length 2.5-3 cm, width 8-10 mm. Inflorescence a solitary, colorful flower produced on a filiform peduncle 1.5-2 cm long, from a node on the secondary stem; floral bract tubular, 4 mm long; pedicel 6 mm long; ovary green, 2.5 mm long; sepals connate for about 5 mm into a short, open, suborbicular cup, ventricose below, with widely spread, yellow, filiform tails up to 2 cm or more long, the dorsal sepal subquadrate, 6 mm long, 5 mm wide, carinate, the free portion transversely triangular, abruptly contracted into the tail, yellow-orange below the middle, purple and minutely glandular-pubescent above the middle, the lateral sepals subquadrate together, 7 mm long, 6 mm wide unspread, the ventricose portion white, the free portions transversely ovate, oblique, pink, contracted into tails similar to the dorsal sepal; petals translucent white, oblong, tridentate, the labellar margin thickened and produced at the base into a prominent, curved process, 4 mm long, 2 mm wide; lip dotted with purple on white, ligulate, tapering from the middle to the acute apex, the disc with a pair of low, indistinct calli, the base truncate, hinged beneath, 4.5 mm long, 2 mm wide; column terete, yellow-white, edged in purple, 4 mm long, with a 3 mm long, curved foot.

ETYMOLOGY: Named in honor of Sra. Patricia Cevallos de Malo of Cuenca, Ecuador.

TYPE: *ECUADOR*: MORONA-SANTIAGO: eastern slopes of the Andes, alt. 2300 m, 1974, B. Malo s.n., cultivated near Cuenca, flowered in cult. 15 July 1977, *C. Luer 1710* (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This little species produces a single, very colorful flower on a peduncle about half as long as the small, obovate leaves. Dense clusters of the stems may amass numerous flowers simultaneously. The sepals are connate into a

rounded cup which is swollen beneath, orange toward the base and purple toward the opening above, the ventricosity white, and pink toward the opening below. The spreading, slender tails are bright yellow.

Masdevallia patula Luer & Malo, sp. nov.

Species haec *M. amaluzae* Luer & Malo affinis, sed planta grandiore, pedunculo longiore, flore multigrandiore longicaudatis, sepalis lateralibus in laminam latam convexam connatis et labello obovato obtuso distinguitur.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, 10-13 mm long, lightly channeled, enclosed by a thin, tubular sheath, unifoliate. Leaf erect, coriaceous, elliptical, petiolate, 5-9 cm long including the petiole, 10-16 mm wide, the apex acute, tridenticulate, the base cuneate into a channeled petiole 2-3.5 mm long. Inflorescence a few-flowered (1-3), contracted raceme of large, successive flowers borne by a slender, reclining or horizontal peduncle 10-15 cm long, with a bract below the middle, from a node low on the secondary stem; floral bract tubular, 6 mm long; pedicel 8 mm long; ovary 3.5-4 mm long, subverrucose, with low carinae; sepals yellowish with red-brown to red-purple stripes along the veins, subcarinate externally, the dorsal sepal obovate, connate to the lateral sepals for 7 mm into a short, cylindrical tube, the free portion narrowly triangular, 3-veined, acuminate into a slender tail, total length 60-71 cm, width 8 mm, the lateral sepals connate 25 mm into an oblong, convex, bifurcated, 6-veined lamina, cellular-glandular within, the free portions triangular, the acute apices acuminate into slender tails similar to that of the dorsal sepal, the total length 62-88 mm, 15-18 mm wide; petals translucent white with a purple stripe, subfalcate, the apex acute, 6 mm long, 1.5 mm wide, with thickenings along both margins, that along the lower margin ending in an obtuse swelling below the middle; lip rose-red, obovate, 7.5 mm long, 4 mm wide, obtuse at the apex, the base thickened with rounded margins, lightly retuse, hinged beneath, the disc with a low pair of irregular carinae; column stout, green edged in purple, 4 mm long, with a foot equally long, with an incurved extension.

ETYMOLOGY: From the Latin *patulus*, "outspread," in reference to the large, wide-spread synsepal.

TYPE: *ECUADOR*: MORONA-SANTIAGO: epiphytic in cloud forest of the Cordillera Oriental, alt. 2200 m, April 1975, B. Malo s.n., cultivated near Cuenca, flowered in cult., 9 July 1977, C. Luer 1656 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

This species is closely related to the much smaller *Masdevallia amaluzae* Luer & Malo and *M. carmenensis* Luer & Malo. The three form a small, local alliance. The huge flower of *M. patula* seems too large for the plant, only a few flowers produced successively at the end of a long, weak peduncle. The sepals, prominently veined in red-brown, are united into a short, cylindrical tube. The long, filamentous tail of the dorsal sepal arches forward. The lateral sepals are connate into a conspicuous, broad, convex lamina which bifurcates into the long, filiform tails. The thick-based lip is obovate and obtuse.

Masdevallia persicina Luer, stat. et nom. nov.

Masdevallia wagneriana Lind. ex Lindl. & Paxt. var. *ecuadorensis* Braas, *Orquideologia* 12:30. 1977.

A *Masdevallia wagneriana* Lind. ex Lindl. & Paxt. cupula sepalorum profunde cylindrica caudis strictis retroflexis, petalis cum dente longo angosto deflexo et labello sigmoideo sine alis dignoscenda.

Plant small, epiphytic, caespitose; roots fine, flexuous. Secondary stems abbreviated, 5-10 mm long, blackish, unifoliate, enclosed by 1-2 thin, white sheaths. Leaf erect, dark green, coriaceous, petiolate, broadly elliptical, 2-4 cm long including the petiole 0.5-1.5 mm long, 12-20 mm wide, the subacute to obtuse apex tridenticulate, the base cuneate into the petiole. Inflorescence a solitary flower borne by a suberect, slender peduncle 3-3.5 cm long, with a bract at the base, from a node low on the secondary stem; floral bract tubular, 5-7 mm long; pedicel 10-11 mm long; ovary 6 mm long; dorsal sepal yellow, dotted with red along the midvein, obovate, 8.5 mm long, 8 mm wide, connate 6 mm to the lateral sepals to form a deep, cylindrical tube, the free portion broadly rounded, abruptly produced into a sharply retroflexed, slender, straight, yellow-green tail with an orangish apex, 33-35 mm long; lateral sepals yellow suffused with pink, microscopically pubescent within, connate 10 mm into a transversely obovate lamina, 12 mm long, 18 mm wide together, the broadly obtuse apices produced into deflexed tails similar to that of the dorsal sepal; petals yellow, oblong, 5 mm long, 1.3 mm wide, the truncate apex indistinctly denticulate, the lower margin thickened with a slender, acute, deflexed tooth from the lower third; lip oscillating, yellowish white with purple dots, oblong, sigmoid in profile, 6 mm long, 1.5 mm wide, narrowed toward the reflexed, narrowly obtuse, purple apex, the base rounded, flexibly hinged beneath to the column-foot, the margins decurved with minute, vestigial wings near the middle; column semiterete, white marked with red-purple, 5 mm long, the foot short with an incurved extension.

ETYMOLOGY: From the Latin *persicinus*, "peach-colored," in reference to the yellow flowers suffused with pink that imparts the color of a peach.

TYPE: *ECUADOR*: ZAMORA-CHINCHIPE: epiphytic in cloud forest between Loja and Zamora ca. 1600 m, June 1974, W. Teague s.n., *R. Escobar 1479* (HOLOTYPE: JAUM), cultivated at La Ceja, Colombia, by M. & O. Robledo, flowered in cult. 20 Jan. 1978, *C. Luer 2286* (CLONOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

ADDITIONAL MATERIAL EXAMINED: Same area and collector, cultivated in Cuenca by A. Andreetta, flowered in cult. 16 Feb. 1978, *C. Luer 2595* (SEL).

The existence of this pretty little species has been known to C. H. Dodson since his early travels on foot and mule-back to Zamora in the Oriente of southern Ecuador. He found it along with *Masdevallia strobilii* Sweet & Garay, and material of both species was forwarded to the Oakes Ames Herbarium at Harvard. Recent collections by Walter Teague have again brought this species into cultivation.

Masdevallia persicina, closely related to *M. wagneriana* and its allies, may be distinguished by the peach-colored, deep sepaline tube with acutely

reflexed, straight tails. The oblong petal is furnished with a slender, deflexed tooth on the lower third. The lateral wings of the lip, so prominently developed in the other known species of the alliance, are reduced to mere vestigial nubbins.

Masdevallia phoenix Luer, sp. nov.

Inter species sectionis *Alaticaulium* Krzl. sepalis intense maculatis, sepalis lateralibus late expansis intus carinatis, caudis omnium angustis subparallelis, callo basali petali rotundato, labello oblongo maculato marginibus supra medium apiceque denticulatis recurvatis distinguitur.

Plant medium in size, presumably epiphytic, caespitose; roots coarse, flexuous. Secondary stems abbreviated, 1-2.5 cm long, enclosed by 1-2 short, tubular sheaths, unifoliate. Leaf erect, coriaceous, narrowly elliptical, 8-15 cm long, 18-25 mm wide, the subacute apex tridenticulate, the base narrowed gradually into a channeled petiole 2-4 cm long. Inflorescence a congested raceme of several (6-9), successive flowers at the apex of an erect, sharply 3-angled peduncle, 17-32 cm long, with a basal bract, from near the base of a secondary stem; floral bracts conduplicate, imbricating, thin, 10 mm long, enclosing the pedicels about 5 mm long; ovary shiny green, 5 mm long; sepals dull greenish rose, heavily spotted with dark purple, the dorsal sepal obovate, connate 9 mm to the lateral sepals to form a spreading, subconical cup, the free portion triangular, the acute apex acuminate into a narrow tail directed forward over those of the lateral sepals, the total length 63 mm, width 12 mm, the lateral sepals ovate, oblique, connate about 20 mm to form a broadly expanded lamina 22 mm wide, with a narrow mentum, each lateral sepal with 3 smooth lamellae which become verrucose toward the acuminate, caudate apices, the tails directed forward with the tail of the dorsal sepal, total length of the lateral sepals 62 mm; petals greenish white marked with purple, oblong, 8 mm long, 2 mm wide, apiculate at the rounded apex, with a thickening along the lower margin ending at the base in a spherical callus; lip greenish white spotted with dark purple, oblong, 9 mm long, 5 mm wide, the margins above the middle erose and revolute, the apex subacute, denticulate-lacerate, recurved, with a small, central callus, the base truncate, hinged below; column green, semiterete, 7 mm long, the foot spotted with purple, 6 mm long with a short, incurved extension.

ETYMOLOGY: Named for the ancient legendary, purple-red, long-lived bird-monster.

TYPE: PERU: HUANUCO: obtained by J & L Orchids from R. Stumpfle s.n., cultivated in Easton, Conn., flowered in cult. 7 Nov. 1977, *C. Luer 2119* (HOLOTYPE: SEL).

DISTRIBUTION: Peru.

Although vegetatively very similar to many other species of the winged-peduncle (*Alaticaulum*) section, the flower of *Masdevallia phoenix* is very distinctive, resembling the purple-spotted head of a bird. Like a narrow bill, the tails of the three sepals are directed forward together. The bases of the lateral sepals flare as they emerge from the broad, conical, sepaline cup, contrasting with the dorsal sepal that immediately attenuates above. The base of

the petal is furnished with a spherical callus, and the margins above the middle of the lip are recurved and denticulate.

Masdevallia picta Luer, sp. nov.

Planta mediocris caespitosis, caulibus secundariis gracilibus longis, foliis coriaceis ellipticis petiolatis, flore solitario picto, pedunculo folio subaequilongo, cupula sepalorum brevi, sepalis niveis roseo laete suffusis caudis aurantiacis, petalis oblongis truncatis callo marginali cum dente basali, labello subpandurato bicalloso apice rotundato notabilis.

Plant small to medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems slender, 3-7.5 cm long, enclosed by a loose tubular sheath from below the middle and another 1-2 short sheaths at the base, unifoliate. Leaf erect, coriaceous, elliptical, petiolate, 7-11.5 cm long including the petiole, 15-22 mm wide, the subacute apex tridenticulate, the base cuneate into a channeled petiole 2-3.5 cm long. Inflorescence a single-flowered, erect, slender peduncle (occasionally 2) 5-10 cm long, with a bract near the base, from a node high on the secondary stem; floral bract tubular, 9 mm long; pedicel 12-16 mm long; ovary 5 mm long; flower gaping, colorful; dorsal sepal white, suffused with orange toward the base, suffused with bright rose on either side of the carinate midvein, obovate, connate to the lateral sepals for 7 mm into a short, cylindrical tube, the free portion triangular, the acute apex acuminate into a slender, bright orange tail 2.5-3.5 cm long, the total length of the dorsal sepal 33-45 mm, width 5 mm, the lateral sepals white above the middle, bright purple below the middle, very narrowly ovate, connate 8 mm creating a shallow mentum, the free portions gradually acuminate into slender, orange tails similar to that of the dorsal sepal, total length 30-45 mm, 10 mm wide together; petals white, marked with purple along the callus, oblong, 4.5 mm long, 1.8 mm wide, the apex truncate, shallowly tridentate, with a thick callus along the lower margin ending in a short, free tooth at the base; lip white, minutely speckled with purple, oblong-subpandurate, 5 mm long, 2 mm wide, the apex rounded, the base truncate, retuse, hinged beneath, the disc with a low pair of longitudinal calli down the middle; column white, marked with purple, semiterete, 4 mm long, with a short foot and an incurved extension.

ETYMOLOGY: From the Latin *pictus*, "painted, colored," in reference to the colorful flowers.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: cloud forest east of Loja, alt. 2800 m, Sept. 1972, B. Malo 30, cultivated near Cuenca, flowered in cult. 13 July 1977, C. Luer 1694 (HOLOTYPE: SEL).

DISTRIBUTION: Southeastern Ecuador.

The colorful flowers of this species are borne singly on slender, elongated peduncles to about as high as the leaves. The cylindrical sepaline tube is orange at the very base, then suffused with bright purple fading to white as the sepals part and spread with long, slender, bright orange tails. The callus of the oblong, truncate petal ends in a short tooth at the base, and the small, purple-dotted lip is lightly pandurate with a rounded apex.

Masdevallia pinocchio Luer & Andreetta, sp. nov.

Ab speciebus sectionis *Alaticaulium* Krzl. dignoscenda floribus aureis, cupula sepalorum subnulla, mento sepalorum lateralium grandi caulibus brevibus et labello marronino oblongo base deflexo oscillanti.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems channeled, ca. 1 cm long, unifoliate, with 2 broad, loose sheaths. Leaf erect, light green, thickly coriaceous, petiolate, elliptical, 7-12 cm long including the petiole 2-4 cm long, 19-23 mm wide, the subacute apex tridenticulate, the base cuneate into the petiole. Inflorescence a several-flowered (to 9), congested raceme of successive, widely spread, yellow-orange flowers borne at the summit of an erect, sharply triquetrous peduncle, 16-21 cm long, subtended by a tubular bract, from the base of the secondary stem; floral bract white, papery, 1 cm long; pedicel 2-2.5 cm long; ovary yellow, 6-8 mm long; dorsal sepal bright yellow-orange, minutely subverrucose, narrowly triangular, the apex thick, long-acuminate, acute, 27 mm long, 9 mm wide, connate to the lateral sepals for 3 mm, at recurved margins not forming a sepaline cup; lateral sepals orange suffused with brown, minutely subverrucose, connate 12 mm into an ovate, bifid synsepal forming a deep, laterally compressed, conical mentum, the free portions, narrowly triangular, acuminate, acute, the total length 20 mm, 15 mm wide together; petals yellow, ovate-oblong, oblique, 6 mm long, 3 mm wide, the apex truncate, obscurely 3-lobed or shortly apiculate, dilated below the middle with a subacute angle at the base of the lower margin, with a thick, flat callus above the middle and a smooth, ovoid callus near the base above the lower margin; lip conspicuous, oscillating, maroon, oblong, 8 mm long, 3.25 mm wide, the margins above the middle deflexed, sinuate, the apex acute, decurved, the base thick, acutely recurved, flexibly hinged to the column-foot; column semiterete, yellow-white, 7 mm long, with a forwardly angled foot.

ETYMOLOGY: Named for Pinocchio, the long-nosed, wooden puppet that wanted to be a little boy, a character created by nineteenth century Carlo Lorenzini.

TYPE: ECUADOR: NAPO: epiphytic in Quijos Valley near Rio Solada, alt. ca. 1500 m, Jan. 1976, A. Andreetta & A. Hirtz 20, cultivated in Cuenca, flowered in cult. 5 Feb. 1978, C. Luer 2461 (HOLOTYPE: SEL).

DISTRIBUTION: Eastern Ecuador.

This species, vegetatively similar to many others of the *Alaticaulium* section, bears a succession of unique flowers at the apex of the sharply three-angled peduncle. The first two flowers of a peduncle are the largest and usually produced simultaneously. A large mentum protrudes behind the yellow-orange flower that gapes widely to expose fully the column, petals and lip. The most conspicuous, maroon lip is delicately balanced on the forwardly angled column-foot so that it gently wobbles from the slightest disturbance. The oscillating lip is reminiscent of that of *Masdevallia wagneriana* Lind. ex Lindl. & Paxt.

Masdevallia polyphemus Luer, sp. nov.

Species haec *Masdevalliae wallisii* Rchb. f. persimilis sed epichilio labelli transverse trapeziformi concavo marginibus non-incurvatis distinguitur.

Plant large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems channeled, 3-6 cm long, unifoliate, clothed by 2-3 loose, tubular sheaths. Leaf erect, light green, thinly coriaceous, plicate, carinate along the dorsal vein, elliptical, 12-25 cm long, 3-5 cm wide, the apex acute, tridenticulate, gradually narrowed to the conduplicate base. Inflorescence a few-flowered raceme of successive, large, widespread flowers borne by a more or less horizontal, purplish peduncle 10-12 cm long, with distant bracts, from the base of the secondary stem; floral bract tubular, 15 mm long; pedicel 21 mm long; ovary dark green, subverrucose, 7 mm long; sepals densely spotted with brownish maroon on pinkish buff, the spots confluent toward the apices and margins, greenish white centrally, covered within by a short, dense pubescence; dorsal sepal more or less flat, ovate, connate to the lateral sepals for 10 mm, the acute apex acuminate into a straight, filiform, maroon tail, the total length 105 mm, the width 22 mm; lateral sepals broadly ovate, connate 18 mm to form a broad, shallow mentum, the acute apices produced into diverging tails similar to that of the dorsal sepal, the total length 105 mm, each 25 mm wide; petals ivory, marked with brown, obovate-spatulate, 6.5 mm long, 3 mm wide, the apex bivalved, papillose between the laminae, the inner lamina shorter, subacute, verrucose, the outer lamina rounded; lip white, spatulate, 13 mm long, 12 mm wide, the hypochile oblong, 5 mm long, 4 mm wide, with erect, obtuse, marginal angles, cleft between, the base concave, flexibly hinged to the column-foot, the epichile transversely trapeziform, 10 mm long, 12 mm wide, concave with the sides more or less erect, not incurved, with multiple, elevated, radiating veins within; column stout, greenish white, 6 mm long, with a foot 4 mm long.

ETYMOLOGY: Named for the Cyclops of Greek mythology who imprisoned Odysseus in a cave and ate some of his companions.

TYPE: ECUADOR: PICHINCHA: epiphytic in cloud forest along the old road between Quito and Santo Domingo, above Chiriboga, alt. ca. 2000 m, 1975, B. Malo s.n., cultivated near Cuenca, flowered in cult. 13 Feb. 1978, C. Luer 2565 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This species appears very similar to the Colombian *Masdevallia wallisii* Rchb. f., but it is distinguished from the latter by the shape of the epichile of the lip. Like that of *M. wallisii*, the lip of *M. polyphemus* is flexibly hinged to the column-foot, but the epichile is trapeziform in outline, or possibly it could be considered to be broadly triangular, depending upon the interpretation of the broadly obtuse or rounded apical margin. The broad lateral angles of the margin curve upward without curving in. The concavity is filled with radiating lamellae.

Masdevallia psyche Luer & Andreetta, sp. nov.

Species haec a speciebus ceteris sectionis *Saccilabiatae* Rchb. f. foliis anguste linearibus, floribus campanulatis parvis eburneis purpureo vittatis, pilis albis apicibus purpureis et epichilio labelli suborbiculari marginibus involutis distinguenda.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems channeled, 2-4 cm long, unifoliate, clothed by 2-3 loose,

tubular sheaths. Leaf light green, erect, coriaceous, very narrowly elliptical to linear, 9-19 cm long, 8-15 mm wide, dorsally carinate along the midvein, the acute apex tridenticulate, gradually narrowed to the conduplicate base. Inflorescence a congested, few-flowered (to 3) raceme of successive flowers borne by a slender, purplish, sparsely bracted, ascending to descending peduncle 7-15 cm long, from the base of a secondary stem; floral bract tubular, 7-8 mm long; pedicel 8-10 mm long; ovary brown, subverrucose, 3 mm long; sepals light yellow to white, edged in purple-brown with radiating veins of pink to purple from the bases to the margins, glabrous externally, with white pubescent hairs tipped in purple internally, the dorsal sepal transversely ovate, 8 mm long, 11 mm wide, connate 5 mm to the lateral sepals to form a campanulate sepaline cup, the obtuse apex produced into a forwardly directed, filiform, maroon tail 35-37 mm long, the lateral sepals connate 8 mm into a concave, broadly "U-shaped" synsepal, each lateral sepal oblong, oblique, 13 mm long, 8 mm wide, the acute, acuminate apices approximate with closely parallel, straight tails similar to that of the dorsal sepal; petals light green, oblong, 2.5 mm long, 1 mm wide, the apex bivalved, slightly scabrous between the laminae, the inner lamina acute, the outer lamina subacute; lip white suffused with orangish pink, spatulate, 5 mm long, 3.5 mm wide, the hypochile 3 mm long, 2.25 mm wide, with obtuse marginal angles, channeled centrally, the base concave, hinged to the column-foot, the epichile subspherical, 3 mm long, 3.5 mm wide, deeply concave with involute margins, with 5 elevated, radiating veins within; column stout, bright yellow, 3.25 mm long, with an equally long, stout foot.

ETYMOLOGY: Named for Psyche, the Greek mythological winged fairy, the personification of the soul, loved by Eros. Literally *psyche*, "breath" or "butterfly."

TYPE: *ECUADOR*: CARCHI: epiphytic in cloud forest above Maldonado, alt. ca. 2000 m, Oct. 1975, A. Andreetta & A. Hirtz 35, cultivated in Cuenca, flowered in cult. 4 Feb. 1978, C. Luer 2463 (HOLOTYPE: SEL), same area 21 Feb 1978, C. Luer, J. Luer & A. Hirtz 2686 (SEL).

DISTRIBUTION: Northwestern Ecuador.

This pretty little species is apparently endemic in the Occidente of Carchi in northern Ecuador. The slender leaves are similar to those of some of the other small-leaved species of the section. The peduncles, either ascending or descending, bear distinctive flowers. The sepals are united into a fairly well-developed cup, striped with light to darker purple toward the margins where the lines coalesce. Opposite the slender tail of the dorsal sepal, the pair of closely parallel tails of the lateral sepals point downward. The epichile of the lip is suborbicular, hollow and lined with several radiating lamellae.

Masdevallia pyxis Luer, sp. nov.

Planta mediocris epiphytica caespitosa, caulibus secundariis semiteretibus unifoliatis, foliis crassis anguste obovatis petiolatis, pedunculo brevi gracili purpureo guttato, bractea floris inflata punctata, sepalo dorsali flavo-virenti oblongo cum synsepalo purpureo profunde cymbiformi duplo longiore in tubo cylindrico connato, cauda superna quam lamina aequilonga,

caudis inferis brevissimis, petalis oblongis truncatis, labello purpureo guttato oblongo supra medium dilatato apice rotundato callo verrucoso.

Plant medium in size, epiphytic, caespitose; roots slender, flexuous. Secondary stems stout, semiterete, spotted with purple, 3-5 cm long, unifoliate, enclosed by 2-3 gray, loose, tubular sheaths. Leaf erect, thickly coriaceous, narrowly obovate, petiolate, 9-16 cm long including the 3-5 cm long petiole, 16-27 mm wide, the apex subacute to obtuse, tridenticulate, the base gradually narrowed into the channeled petiole. Inflorescence a solitary flower borne by a slender, erect peduncle intensely dotted with purple, 4.5-5 cm long, with a basal bract, from low on the secondary stem; floral bract white, loose, speckled with purple, 10 mm long; pedicel dotted with purple, 15 mm long; ovary green, angled with the pedicel, 5 mm long; dorsal sepal yellow-green, dotted with red externally along the midvein, oblong, connate 10 mm with the synsepal into a cylindrical tube, the free part broadly triangular, the obtuse apex contracted into a yellow, terete tail ca. 10 mm long, the total length 21 mm, the width 7 mm; lateral sepals dark red-purple, connate 20 mm into a broadly elliptical, deeply cymbiform, obtuse lamina, 15 mm across spread out, the apices produced into short, 3 mm long, green, forwardly directed tails, the total length 24 mm; petals white, oblong, 6.5 mm long, 2 mm wide, the truncate apex obscurely bilobed, both upper and lower halves thickened, the lower more than the upper; lip ivory spotted with red-purple, narrowly oblong, dilated above the middle, 7 mm long, 2.5 mm wide, the apex rounded, with a verrucose callus, the base retuse, hinged beneath, the disc with a pair of angled lamellae near the middle; column white, stout, semiterete, 6 mm long, the foot 3 mm long, with a short, incurved extension.

ETYMOLOGY: From the Latin *pyxis*, "a small box," in allusion to the appearance of the flower.

TYPE: PERU: HUANUCO: near Tingo Maria, March 1975, Janet Kuhn s.n., cultivated at La Ceja, Colombia, by M. & O. Robledo, flowered in cult. 21 Jan. 1978, *C. Luer* 2295 (HOLOTYPE: SEL, ISOTYPE: JAUM).

DISTRIBUTION: Peru.

Although vegetatively very similar to many other species of *Masdevallia*, the solitary flower of *M. pyxis*, borne by a short, terete peduncle, is very distinct. Practically the entire length of the short-tailed dorsal sepal is connate to the united lateral sepals to form a box-like sepaline tube. The sides of the box are formed by the twice larger, concave synsepal which terminates in a very short pair of thick tails.

Masdevallia rodolfoi (Brass) Luer, stat. et comb. nov.

Masdevallia wagneriana Lind. ex Lindl. & Paxt. var. *rodolfoi* Braas, Orquideologia 12:23. 1977.

A *Masdevallia wagneriana* Lind. ex Lindl. & Paxt. cupula sepalorum late patenti sepalis crassis majoribus caudis proportione brevioribus, petalis cum dente acuto prope medium et alis labelli integris dignoscenda.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems terete, blackish, 10-12 mm long, unifoliate, enclosed by 1-2 thin, tubular sheaths. Leaf erect, coriaceous, dark green, petiolate, broadly elliptical, 3-

7 cm long including the 1-2.5 cm long petiole, 15-24 mm wide, the obtuse apex tridenticulate, the base cuneate into the blackish petiole. Inflorescence a solitary flower borne by a suberect, slender peduncle 1.5-2.5 cm long, with a basal bract, from a node low on the secondary stem; floral bract tubular, 7 mm long; pedicel 11 mm long; ovary green, 7 mm long; dorsal sepal yellow, diffusely studded within with red, glandular cells, marked with red along the veins toward the base, transversely obovate-oblong, concave, carinate within along the veins, 12 mm long, 15 mm wide, connate to the lateral sepals for 6 mm into a widely spread, shallow cup, the free portion broadly rounded, the truncate apex transversely thickened, abruptly produced into a reflexed, thick, green tail 15 mm long; lateral sepals colored similarly to the dorsal sepal, connate 9 mm into a transversely oblong lamina, 13 mm long, 24 mm wide, the obtuse apices produced into 9 mm long, reflexed tails; petals yellow marked with purple, oblong, 4 mm long, 1.5 mm wide, the obtuse apex retuse, the labellar margin thickened with a subacute, retrorse, triangular process near the middle; lip oscillating, yellow marked with purple, oblong-3-lobed, 3.5 mm long, 2 mm wide, the lateral lobes or wings rounded, narrowed toward the recurved, narrowly obtuse apex with a central callus, the base rounded and concave below with revolute margins, delicately hinged within to the column-foot; column thick, semiterete, cream-colored, flecked with red, 4 mm long, the thick foot 3 mm long, with a filamentous extension.

ETYMOLOGY: Named in honor of Sr. Rodolfo Stumpfle of Lima, Peru, who discovered this species.

TYPE: PERU: JUNIN: San Ramon y La Merced near Chanchamayo, alt. 2000 m, June 1971, R. Stumpfle 671-1, R. Escobar 1638 (HOLOTYPE: JAUM), cultivated at La Ceja, Colombia, by M. & O. Robledo, flowered in cult. 5 Oct. 1977, C. Luer 1907 (CLONOTYPE: SEL).

DISTRIBUTION: Peru.

Masdevallia rodolfoi is the largest-flowered species of the *M. wagneriana* alliance. The fleshy, broad sepals are widely spread. The dorsal sepal is concave with the veins standing as three, erect lamellae between the thickened margins. The short, thick tails are retroflexed. The petals are provided with a single, acute, retrorse tooth near the middle of the lower margin. The comparatively small lip is most similar to the farthest known member of the alliance, *M. wagneriana* Lind. ex Lindl. & Paxt., but the wings of the lip of *M. rodolfoi* are entire.

Masdevallia sanctae-inesae Luer & Malo, sp. nov.

Haec species *M. xanthinae* Rchb. f. et affinis similis, sed sepalis suborbicularibus pallide flavovirentibus cum area centrali synsepali aurantiaca, petalis oblongis apice tridentatis margine antico alato basi cum dente lato et labello subquadrato truncato distinguitur.

Plant small, epiphytic, caespitose; roots slender, flexuous. Secondary stems short, 8-15 mm long, blackish, enclosed by 1-2 thin, tubular sheaths, unifoliate. Leaf erect, thin, coriaceous, elliptical, the apex subacute to obtuse, tridenticulate, the base cuneate into a petiole 2-3 cm long, the total length 6-14 cm, width 18-30 mm. Inflorescence a solitary flower borne on a

slender, suberect peduncle 2.5-3 cm long with a basal bract, from a node on the secondary stem; floral bract tubular, 6-8 mm long; pedicel 7-9 mm long; ovary green 5 mm long; dorsal sepal suborbicular, 15 mm long, 15 mm wide, united to the lateral sepals for 8 mm into a broad, shallow, sepaline cup, translucent greenish white with 5 green veins, the subtruncate apex abruptly produced into a greenish orange, filiform tail 32 mm long; lateral sepals suborbicular to broadly ovate, oblique, 12 mm long, 12 mm wide, connate for 8 mm, colored similarly to the dorsal sepal except for a large area of bright orange suffusion beneath the lip to the margin, the obtuse apices contracted into diverging tails similar to that of the dorsal sepal; petals greenish white, oblong, 6 mm long, 3 mm wide, the truncate apex tridentate, the labellar margin with a longitudinal, thickened wing ending in a broad, triangular tooth near the base, the base oblique; lip erect, yellow-green becoming orange toward the apex, subquadrate, 6 mm long, 5 mm wide, the broadly truncate apex margined in deep purple with a small, central callosity, the sides undulate, the base thickened with a pair of rounded calli in the middle, hinged beneath; column semiterete, greenish white marked with purple, 5 mm long, the foot ending in a narrow, incurved extension.

ETYMOLOGY: Named for the orchid finca Santa Ines of Benigno Malo near Tarqui south of Cuenca.

TYPE: ECUADOR: MORONA-SANTIAGO: epiphytic on the east slopes in the southern part of the province, alt. 2500 m, May 1973, B. Malo s.n., cultivated near Cuenca, flowered in cult. 11 July 1977, C. Luer 1686 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This species, similar to *Masdevallia xanthina* Rchb. f. and its numerous relatives, is readily distinguished by the rounded, pale greenish yellow sepals veined in green with a prominent orange suffusion covering the inner halves of the lateral sepals. Obscuring the column and petals, the erect lip stands in the center of the flower, the broad under-surface facing outward.

Masdevallia simia Luer, sp. nov.

Species haec *M. benedictii* Rchb. f. similis, sed epichilio labelli non-concavo longitudinale unicarinato cum lamellis brevibus radiantibus praecipue differt.

Plant medium-sized to large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems channeled, 2-4 cm long, enclosed by 2 loose, tubular sheaths, unifoliate. Leaf erect, thin, coriaceous, very narrowly elliptical, 10-21 cm long, 13-17 mm wide, carinate dorsally, tridentate at the acute apex, the base gradually narrowed into a conduplicate base. Inflorescence a few-flowered, contracted raceme of successive, showy flowers, borne by a more or less horizontal, minimally verrucose peduncle about 10 cm long, from a node on the secondary stem; floral bract tubular, 10 mm long; pedicel 13 mm long; ovary brown, lightly verrucose, 8 mm long; sepals widespread, more or less flat, subcarinate and glabrous externally, covered within by short thick hairs or spicules, the outer halves of the sepals heavily suffused with red-purple, the inner halves white, the dorsal sepal broadly ovate, 20 mm long, 26 mm wide, connate to the lateral sepals 8-9 mm, the obtuse apex

contracted into a slender tail 7 cm long, the lateral sepals broadly ovate, oblique, 20 mm long, 24 mm wide, connate 13 mm to form a broad, shallow mentum, the obtuse apices contracted into tails similar to that of the dorsal sepal; petals thick, elliptical-oblong, 5 mm long, 2.5 mm wide, white marked with brown, bivalved at the rounded apex, papillose between the laminae, the inner lamina toothed and acute; lip spatulate, white, 12 mm long, 9 mm wide, the hypochile 5 mm long, 4 mm wide, cleft centrally, the sides erect, rounded, the base concave, hinged to the column-foot, the epichile broadly ovate, 7 mm long, 9 mm wide, not concave, but slightly curved up at the rounded apex, the disc with a longitudinal keel from the hypochile to the apex, with several lamellae radiating to the flattened, lightly sinuate margins; column stout, white, 5 mm long, with a foot 3 mm long.

ETYMOLOGY: From the Latin *simia*, "an ape or monkey," in fancied allusion to the appearance of the flower.

TYPE: ECUADOR: ZAMORA-CHINCHIPE: epiphytic in cloud forest between Loja and Zamora, alt. ca. 2000 m, B. Malo 25, cultivated by M. & O. Robledo at La Ceja, Colombia, R. Escobar 1692, flowered in cult. 25 Sept. 1977, C. Luer 1836 (HOLOTYPE: SEL, ISOTYPE: JAUM).

DISTRIBUTION: Southeastern Ecuador.

This grotesque species may be distinguished from the closely related *Masdevallia benedictii* Rchb. f. by the ovate epichile of the lip which is provided with a prominent central keel with lesser lamellae radiating downward to a level, non-incurved margin. A distinct zone of white surrounds the column and petals in the otherwise minutely spiculate, deep red-purple sepals imparting the impression of a capuchin monkey.

Masdevallia tarantula Luer, sp. nov.

Masdevalliae nycterinae Rchb. f. affinis sed statura gradiore, ovario subverrucoso non cristato et sepalis longioribus mento grandissimo distinguitur.

Plant large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems channeled, 3-4 cm long, unifoliate, enclosed by 1-2 close, tubular sheaths. Leaf erect, light green, thinly coriaceous, finely veined, carinate along the dorsal midvein, elliptical, 15-20 cm long, 2.5-3.5 cm wide, the sub-acute apex tridenticulate, the base cuneate into an indistinct, conduplicate petiole. Inflorescence a successively few-flowered (to 6) raceme of large, showy flowers borne by an ascending or suberect, scabrous peduncle 11-15 cm long, with a few, widely spaced bracts, from low on the secondary stem, floral bract tubular, 10 mm long; pedicel 15 mm long; ovary greenish brown, subverrucose, 7 mm long; sepals spotted with dark red-brown on an ivory base, the spots confluent toward the apices and margins, with a dense, yellow pubescence within, the dorsal sepal more or less flat, narrowly ovate, connate to the lateral sepals for 9 mm, the acute apex acuminate into a red-brown, filiform tail, somewhat flexuous toward the apex, the total length 105 mm, 22 mm wide, the lateral sepals ovate, oblique, connate 23 mm to form a broad, deep mentum, the acute apices acuminate into more or less parallel tails similar to that of the dorsal sepal, the total length 100 mm, each 24 mm wide; petals ivory, marked with brown, obovate, 4 mm long, 2.5 mm

wide, the apex bivalved, papillose between the laminae, the inner lamina acute, verrucose, the outer lamina rounded; lip white, spatulate, 10 mm long, 11 mm wide, the hypochile oblong, 5.5 mm long, 3.5 mm wide, with erect, obtuse, marginal angles, cleft between, the base concave, flexibly hinged to the column-foot, the epichile transversely elliptical, 6 mm long, 11 mm wide, deeply concave, the sides incurved, with multiple, elevated, radiating veins within; column stout, yellowish white, 4 mm long, with an equally long foot.

ETYMOLOGY: Named for the similarity of the flower to a tarantula, a genus of large, hairy spiders.

TYPE: *ECUADOR*: PICHINCHA: epiphytic in cloud forest above Chiriboga, alt. ca. 2000 m, along the old road between Quito and Santo Domingo, 1975, B. Malo s.n., cultivated near Cuenca, flowered in cult. 4 Feb. 1978, C. Luer 2454 (HOLOTYPE: SEL).

DISTRIBUTION: Western Ecuador.

This species resembles a large form of *Masdevallia nycterina* Rchb. f. The ovary of *M. tarantula* is merely subverrucose compared to the six denticulate wings on the ovary of *M. nycterina*. The sepals of the former are larger, longer, and more gradually attenuate with more intense spotting. The deep mentum formed by the lateral sepals is conspicuous. The tails are similarly very slender and gently flexuous above the middle. Except for their larger size, the petals and lip are not remarkably different.

This species also resembles *M. polyphemus* Luer with which it is known to be sympatric. *Masdevallia tarantula* differs from the latter by the longer sepals with flexuous tails, the tails of the lateral sepals parallel instead of spreading, and the sides of the transversely elliptical epichile of the lip are incurved.

Masdevallia tarantula seems to be intermediate between *M. nycterina* and *M. polyphemus*, and could possibly represent a natural hybrid between the two.

Masdevallia vampira Luer, sp. nov.

Haec species *M. chimaerae* Rchb. f. et affinis similis, sed floribus glabris, sepalis plus minusve complanatis vel leviter concavis viridibus subtiliter intenseque atropurpureo vittatis longicaudatisque, petalis bivalvibus et labello flexibili grandi epichilio ovoideo concavo multinervato distinguitur.

Plant large, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, channeled, 4-6 cm long, unifoliate, sheathed by 1-2 loose, dry sheaths which are often shredded or shed. Leaf erect, elliptical, 15-25 cm long, 4-5.5 cm wide, comparatively thin, sometimes indistinctly plicate, the apex subacute, tridenticulate, the base tapered into a short, ill-defined petiole. Inflorescence a successively several-flowered (5-7) raceme to 17 cm long, borne by a horizontal to descending peduncle, 20 to more than 40 cm long, from low on the secondary stem; floral bract oblique, acute, 12-25 mm long; pedicel 18-25 mm long; ovary verruculose, dark olive-green, 10 mm long; flowers widely spread, horizontally dependent; sepals glabrous, more or less flat or slightly concave, light green but the green largely obscured by multiple, thin, more or less parallel, longitudinal, blackish purple veins that converge toward the apices, the dorsal sepal ovate, 2.4-5.5 cm long, 2.2-4 cm

wide, connate to the lateral sepals for 1.5 cm, the subacute apex contracted into a straight, filiform, blackish tail 5-11 cm long, the lateral sepals ovate, oblique, connate in a broad, shallow mentum, to near the middle into a synsepal 3-6 cm long, 2.2-7 cm broad, the subacute apices contracted into tails similar to that of the dorsal sepal; petals white, marked with purple, thick, oblong, 6 mm long, 2 mm wide, the obtuse apex bivalved with a verrucose callus protruding from between the laminae; lip white with pinkish to yellowish veins, 15-24 mm long, 11-17 mm wide, the hypochile cleft with obtuse, erect, lateral angles and with denticulate carinae extending forward, loosely hinged to the column-foot, 7 mm long, 5 mm wide, the epichile ovoid, concave, the margins incurved, with multiple, branching, elevated, radiating veins within, 10-17 mm long, 11-17 mm wide; column yellow. stout, 7 mm long, with a thick foot nearly as long.

ETYMOLOGY: Named for the resemblance of the flowers to a bat; from old middle European *vampir*, and *Vampirus*, a genus of bats.

TYPE: *ECUADOR*: PICHINCHA: epiphytic in cloud forest along the old road between Quito and Santo Domingo, alt. ca. 2000 m, B. Malo s.n., cultivated near Cuenca, flowered in cult. 20 July 1977, C. Luer 1819 (HOLOTYPE: SEL).

ADDITIONAL MATERIAL EXAMINED: same area, Jan. 1973, A. Andreetta 6, cultivated in Cuenca, flowered in cult. 12 July 1977, C. Luer 1692 (SEL).

DISTRIBUTION: Western Ecuador.

This magnificent species, commonly known as the "black chimaera," has been in cultivation for about fifteen years. The leaves are often broad and more or less plicate. The long, horizontal or drooping peduncle bears a succession of immense flowers totally hairless and without warts. The broad, flat sepals are green, but this base color is not readily visible because it is overlaid by numerous, thin, purplish black veins that converge at the apices to convey a black appearance to the flower. The black tails are long and slender. The large, concave, multiveined epichile of the lip occupies the center of the flower. The lip is flexibly hinged to the column-foot, not rigidly fixed as in *M. chimaera*.

In common with many allied species, exposure for a few minutes to warm or dry air causes the flower to become limp. The sepals and tails promptly regain their rigidity and stand straight out on a 180° plane after return to a cool, moist atmosphere.

Masdevallia virgo-cuencae Luer & Andreetta, sp. nov.

Species haec *M. carruthersianae* Lehm. ex Krzl. et affinis cognata sed flore grandi pulcherrimo, sepalo dorsali aureo cauda gracili curvata, synsepalo roseo vittato late elliptico e cupula sepalorum deflexo caudis brevibus reflexis dignoscenda.

Plant medium in size, epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, 1-2.5 cm long, enclosed by 1-2 thin, deciduous sheaths, unifoliate. Leaf erect, light green, fleshy, coriaceous, elliptical, subpetiolate, 8-10 cm long, 20-28 mm wide, the apex subacute to obtuse, tridentate, the base cuneate into a short, indistinct, channeled petiole. Inflorescence a

several-flowered (5-9), congested raceme of successive, showy flowers atop an erect, triquetrous peduncle, 14-20 cm long, from a node low on a secondary stem; floral bracts imbricating, oblique, papery, 8-15 mm long; pedicel 17-18 mm long; ovary tri-lobate, 5 mm long; dorsal sepal yellow, minutely speckled with red within, narrowly elliptical, concave, connate 15 mm to the lateral sepals into a well-formed sepaline tube, the free portion narrowly triangular, lightly carinate, deflexed, then tapered into a slender, recurved tail, the total length 6.5 cm, 10 mm wide; lateral sepals light purple, darker purple in stripes along the nerves, glandular-cellular, connate ca. 3 cm into a broadly elliptical, convex, deflexed lamina, constricted above the narrowed, concave base, the apices acuminate into short, slender, recurved, green tails 1 cm long, the total length 5.5 cm, 2.5 cm wide; petals white, oblong, 7.5 mm long, 3 mm wide, the obtuse apex irregularly apiculate, with a low, smooth callus above the lower margin; lip white, flecked with purple, oblong-subpandurate, 6 mm long, 1.5-2 mm wide, the apical portion elliptical, subacute, denticulate, papillose, with a pair of folds near the middle, oblong below the middle, the base thickened, rounded, hinged below; column semiterete, white, edged in purple, 5.5 mm long, the foot 3 mm long with a curved, spotted extension.

ETYMOLOGY: From the Latin *virgo*, "maiden" and *Cuencae*, "of Cuenca," in reference to the area where the species was found.

TYPE: ECUADOR: AZUAY: epiphytic in a valley above Machangara near Cuenca, alt. 2700 m, Feb. 1977, A. Andreetta 3, cultivated at Cuenca, flowered in cult. 12 July 1977, C. Luer 1688 (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This very showy species of the *Alaticaulis* section is characterized by the large, colorful flower. A single plant of this very showy species was discovered in 1976 by Sra. Elizabeth Strobel of Cuenca, Ecuador. It was given to Padre Andreetta who was successful in finding one more plant in the same area. A recent search failed to produce another plant.

Large colorful flowers are borne successively atop a long, 3-angled peduncle. The dorsal sepal is gracefully curved above a broad, rose-striped synsepal that curves beneath with short tails that sometimes cross each other. The petals and lip are not remarkably distinct from its congeners.

***Masdevallia vittata* Luer, sp. nov.**

M. triaristellae Rehb. f. et affinibus similis, sed foliis latioribus, pedunculo nonverruculoso, sepalis vittatis, caudis sepalorum brevibus crassisque caudis sepalorum lateralium ex apicibus orientibus, et labello tricalloso differt.

Plant very small, epiphytic, caespitose; roots slender, flexuous. Secondary stems abbreviated, 2-3 mm long, concealed by a short, thin, tubular sheath, unifoliate. Leaf erect, thickly coriaceous, narrowly elliptical to narrowly obovate, subacute, tridenticulate, speckled with purple beneath, 20-25 mm long, 5-7 mm wide. Inflorescence a congested, few-flowered (2 or more ?) raceme of successive flowers; peduncle glabrous, erect, filiform, from a node on the secondary stem, 3.5-4 cm long; floral bract tubular, 5 mm long; pedicel 5 mm long; ovary very lightly verrucose, 2 mm long; sepals

yellow, suffused and prominently striped with purple, connate to the synsepal for 3 mm, transversely cuneate, 3 mm long, 6 mm wide, the free margin broadly obtuse, minutely ciliated, abruptly produced into a thick, curved, yellow tail 6 mm long, the lateral sepals connate for 5 mm into a broad, concave synsepal, 7 mm broad, the free portions triangular, about 4 mm long, tapered at the apices into thick, 3-4 mm long, yellow, diverging tails, each lateral sepal about 8 mm long exclusive of the tail, 3.5 mm wide; petals oblong, slightly dilated near the middle, 3.25 mm long, 1 mm wide, the apex truncate, minutely tridenticulate, translucent white with a broad purple stripe; lip red-purple, oblong-ovate, 3.5 mm long, 1.25 mm wide, the apex rounded, the base sagittate, the disc traversed by 3 parallel, longitudinal calli; column red, cylindrical, 3 mm long, with a foot 1.5 mm long.

ETYMOLOGY: From the Latin *vittatus*, "longitudinally striped," in reference to the prominently striped sepals.

TYPE *ECUADOR*: AZUAY: western slopes of the Andes, alt. 1900 m, August 1974, B. Malo s.n., cultivated by him near Cuenca, flowered in cult. 20 July 1977, *C. Luer 1756* (HOLOTYPE: SEL).

DISTRIBUTION: Southern Ecuador.

This little species is easily distinguished from the other members of the section by the comparatively broad leaves, the glabrous peduncle, the purple-striped sepals connate into a broadly patent sepaline cup and terminated at the apices by short, thick, diverging tails, and the narrowly ovate lip lined by three low calli.

Masdevallia whiteana Luer, sp. nov.

Planta mediocris caespitosa, caulibus secundariis crassis abbreviatis unifoliatis, foliis coriaceis erectis anguste obovatis sensim petiolatis, pedunculo triquetro erecto folio paulo longiore, racemo paucifloro contracto, floribus successivis carnosus marrononis caudis luteis sepalis brevioribus, cupula sepalorum subquadrata gibbosa, petalis albis oblongis callo longitudinali, labello roseo punctato subpanduriformi obtuso.

Plant medium in size, presumably epiphytic, caespitose; roots coarse, flexuous. Secondary stems stout, abbreviated, 1-1.5 cm long, unifoliate, with 2-3 short, loose, papery sheaths. Leaf erect, fleshy, coriaceous, narrowly obovate, obtuse, the base gradually narrowed into a channeled petiole, 11-15 cm long, 18-22 mm wide. Inflorescence a succession of single flowers in a contracted raceme at the apex of an erect, sharply 3-angled peduncle, 18-26 cm long from near the base of a secondary stem; floral bract papery, 5-10 mm long; pedicel about 10 mm long; ovary green, 5 mm long; sepals rigid, fleshy, dark purple or maroon, orange toward the base, with yellow tails about 1 cm long, the dorsal sepal united to the lateral sepals for 10 mm, obovate, the apex abruptly acuminate into the tail, total length 30-34 mm, 10 mm wide, the lateral sepals connate to the bases of the close, diverging tails into a deeply concave, elliptical synsepal with a distinct mentum, total length 28-32 mm, 18 mm wide spread out; petals white, oblong, rounded and retuse at the apex, with a low, longitudinal callus along the labellar margin, 7 mm long, 2 mm wide; lip subpanduriform, white, dotted with

pink, the apex obtuse, the base truncate and hinged beneath, the disc with a pair of low folds near the middle, 7 mm long, 3 mm wide; column terete, 6 mm long, white suffused with pink, with a short foot.

ETYMOLOGY: Named in honor of Dr. William E. White of Anniston, Alabama, who submitted the plant to the Orchid Identification Center of the American Orchid Society at the Marie Selby Botanical Gardens.

TYPE: *PERU*: without locality, cultivated by W. E. White 739, OIC-1177, flowered repeatedly in cult., *C. Luer 1608A* (HOLOTYPE: SEL).

DISTRIBUTION: Peru.

This freely flowering species was purchased by Dr. White in 1976 from a company that had imported the plant from Peru, unfortunately without collection data. The sharply three-angled peduncle places the species in Section *Alaticaulis*. The medium-sized maroon flowers are of cardboard-like consistency and long-lasting. The lateral sepals, with the dorsal sepal, form a sepaline cup with a prominent mentum below and then fork into short, yellow tails.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXI

Harold N. Moldenke

CLERODENDRUM FLORIBUNDUM var. **ATTENUATUM** (R. Br.) Moldenke, comb. nov.

Clerodendrum attenuatum R. Br., Prodr. Fl. Nov. Holl. 511. 1810

CLERODENDRUM FLORIBUNDUM var. **CORIACEUM** (R. Br.) Moldenke, comb. nov.

Clerodendrum coriaceum R. Br., Prodr. Fl. Nov. Holl. 511. 1810.

CLERODENDRUM FLORIBUNDUM var. **MEDIUM** (R. Br.) Moldenke, comb. nov.

Clerodendrum medium R. Br., Prodr. Fl. Nov. Holl. 510--511. 1810.

SYNGONANTHUS HATSCHBACHII Moldenke, Phytologia 37: 79, hyponym. 1977; sp. nov.

Herba perennis; caulis simplex erectus 5--7 cm. longus crassus apicaliter foliiferus; foliis rosulatis coriaceis linearibus 2--3 cm. longis ca. 1 mm. latis utrinque glabris nitidisque apicaliter obtusis vel subacutis; pedunculis solitariis vel numerosis 22--32 cm. longis 4-sulcatis glabris; vaginis arcte adpressis 4 cm. longis dense antrorso-hirsutulis; capitulis hemisphaericis ca. 1 cm. latis; bracteis involucrentibus flavidis glaberrimis.

Perennial herb; stem single, simple, erect, 5--7 cm. tall, heavy, 1--1.5 cm. in diameter, narrowest at the base, gradually widening upwards, densely covered by old broken leaf-bases in very close spirals, apically bearing one to several rosettes of leaves and inflorescences; leaves rosulate, very numerous, linear, quite uniform, 2--3 cm. long, about 1 mm. wide throughout, uniformly green on both surfaces, completely glabrous and very shiny on both surfaces, apically obtuse or subacute, mostly more or less recurved or reflexed; inflorescences terminal; peduncles single or numerous in each rosette, very slender, firm, erect, 22--32 cm. long, 4-ribbed and -sulcate, glabrous or practically so, shiny; sheaths closely appressed, 4 cm. long, densely hirsutulous with antrorsely pointing hairs, the apex deeply and irregularly lobed, the lobes acute; heads single, hemispheric, about 1 cm. wide, densely many-flowered, gray; involucre bracts numerous, in several imbricate series, yellowish or yellowish-tan, glabrous, apically acute; for floral characters and dimensions see accompanying illustrations. A - habit of plant, B - staminate floret, C - single stamen, D - apex of sheath, E - flower-head, G, I-K - pistillate florets, the sepals removed, H - 2 pistillate florets attached to receptacle, L - sepal.

The type of this species was collected by Gert Hatschbach (no. 39668) in sandy soil, base of Morrão, munic. Morro do Chapéu, Bahia, Brazil, Jan. 16, 1977, deposited in my personal herbarium.





STUDIES ON VENEZUELAN HEPATICAE, I.

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The present study represents the first in a series of papers intended to clarify problems concerning the Hepaticae of Venezuela. Its intent is to make available for legitimate use the names of a number of new taxa. These have all been uncovered either during studies carried out at the Universidad de los Andes, Merida, Venezuela (during January-March, 1976), or in subsequent collateral studies (during the succeeding two years). The need for legitimizing the names has become pressing for several reasons: (1) duplicates bearing these names have been distributed; (2) the names have been used in ecological discussions in various parts of the work under way and will appear prior to any detailed treatment of the individual taxa; (3) a number of these taxa -- especially the new generic and subgeneric elements -- are illustrated and diagnosed (in English) in the forthcoming second edition of the Hepaticae in Engler & Prantl, Die Natürlichen Pflanzenfamilien; (4) the names of various new taxa of Lejeuneaceae, studied cytologically from fresh material, appear in a paper on the oil-bodies of Lejeuneaceae, to appear shortly in the Journal of the Mattori Botanical Laboratory. It is thus imperative that these names be legitimized.

It is intended to illustrate all new taxa and, to date, over 40 plates have accumulated, as well as over 180 pages of MS. I therefore limit myself here to Latin diagnoses and type citations, plus comments that seem appropriate.

The new records and new taxa here briefly noted represent the most interesting and striking novelties among several thousand collections made and processed. A large number of taxonomic problems remain, some of which will, hopefully, be resolved during the course of the next several years and will be discussed in succeeding numbers of this series.

Of greatest significance is the description on the following pages of 10 new genera (Ruizanthus, Gymnocoleopsis, Pseudocephaloziella, Lophonardia, Platycaulis, Leptoscyphopsis, Rhodoplagiochila, Aureolejeunea, Physoantholejeunea, and Amphilejeunea). Discovery of so many novelties clearly reflects the fact that, up to this time, no trained hepaticologist has had an opportunity to do intensive field work in the region of the northern Andean mountains.

Family BLEPHAROSTOMATACEAE [PSEUDOLEPICOLEACEAE]

1. Temnoma (subg. Blepharotemnoma) chaetophylla Schust., subg.
et sp. n.

Plantae minutae aureo-brunneae; cortex e 10-12 ordinibus cellularum rigidis compositus, cellulis corticalibus diametro 1-1.8 plo maioribus quam cellulae medullosae. Ramificatio typi Frullaniae, Microlepidoziae et ventrali-intercalaris. Folia (2)3-4-lobata, rigida, remota, normaliter sine dentibus; lobi rigidi, setacei, basi latitudine solum ducellulari. ♀ Bractee aliquot dentes spinescentes, non-oppositos (alternatos) praebentes. Type: Estado Merida: La Fria, Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1626).

The first American member of its genus known north of the subantarctic Nothofagus zone. Distinct from all other Temnoma species in the alternate, rather than opposite, spinescent teeth of the ♀ bracts and the usual lack of any dentition of sterile leaves.

Family BALANTIOPSIDACEAE Nakai

2. Isotachis subg. Hypoisotachis Schust., subg. n.

Plantae repentes. Gynoecia (necnon pleraque androecia) ramos ventrali-intercalares valde abbreviatis terminantia; insertio foliorum angusta, in dimidio ventrali succuba, in dimidio dorsali transversa; cacumina foliorum surculorumque a substrato arcuata. Type: Isotachis coilophylla Herz., Repert. Spec. Nov. 21:25, 1925.

This plant, of which I have seen an isotype, is possibly conspecific with I. multiceps (Lindenb. & G.) G. (and is stated to be so by Fulford, 1963, p. 66), but Gottsche draws his plant with gynoecia terminating a leading, leafy axis.

The highly abbreviated, essentially leafless stem-perigynia, plus the antically arched leaves and shoot tips are diagnostic. Perhaps the plant should be placed into an autonomous genus.

3. Ruizanthus Schust., gen. n.

Genus ab omni alio genere Balantiopsidacearum differens ut capsula ellipsoidea valvas erectas, potius quam spiraliter tortas habet. Plantae ± erectae ad procumbentes; ramificatio ventrali-intercalaris; rami saepe geotropici, microphylliosi radiciformes; folia fere symmetrica ad apicem aut (2)3-cuspidata aut 3-4 lobata; cellulae, supra, trigones bene definitos praebentes. Type: Ruizanthus venezuelanus Schust., sp. n. Including two known species only:

R. venezuelanus Schust., sp. n.

Folia matura 4-lobulata, lobis non profundis longe acuminato-cuspidatis, indistincte marginatis (cellulis marginalibus vix maioribus quam intramarginales); gynoecia subisophyllosa. Type:

Estado Merida: Loma Redonda, Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1462).

R. lopezii Schust., sp. n.

Folia matura non profunde 2-lobulata (foliis hic illic 3-lobulatis), lobis brevi-cuspidatis, valde marginatis (cellulis marginalibus amplificatis, pachydermatis); gynoecea anisophylla. Type: Estado Merida: Sierra de Santo Domingo, paramo de Mucubaji, 3600 m. (RMS & L. Ruiz-Teran 76-870).

Family LEPIDOZIACEAE

4. Telaranea (Neolepidozia) rectangularis Schust., sp. n.

Species T. capilligeræ (Schwaegr.) Schust. subantarcticae cognata, propria ut folia oblongo-cuneata, segmentis vix divergentibus; discus rectangulatus, in foliis caulinis 8-seriatus, tam altus quam latus aut altior; lobis in 3-4 cellulis perelongatis terminantibus. Type: Estado Merida: Above Rio Frias, Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1480).

Differing from the other three South American taxa (known only from cool, nontropical southern latitudes) in the narrow leaves with long-tapered, hardly divergent segments.

5. Telaranea (Telaranea) quadrifida Schust., sp. n.

Species T. nematodes cognata ut folia caulina, 3-4-lobata, ad situm 0.35 a basi cellulae basalis remotum divisa. Propria ut discus foliorum caulinarum 8-10 cellulas latus (uno lobo plerumque 3-4 cellulas lato); amphigastria caulina 3-4-lobata, ca. 0.5 aequae longa ac folia. Type: Estado Tachira: Paramo de Tama, Mirador (RMS & L. Ruiz-Teran 76-1974).

A much larger plant than T. nematodes, which also occurs in the region, having 36-42 rows of medullary cells plus 15-16 rows of cortical cells that are only little enlarged vis a vis the medullary cells.

6. Telaranea (Telaranea) microstipulata Schust., sp. n.

Species T. nematodes atque T. quadrifidae cognata, propria, autem, ut folia omnia 2-fida, in caulem inserta ita ut duo ordines cellularum dorsales admodum "sine-foliis" sit; rami saepissime ventrali-intercalares, nonnulli rami, autem, typi Frullaniae ad angulum cauli sub-acutum orientes; amphigastria vestigialia. Type: Estado Tachira: Paramo de Tama (RMS & L. Ruiz-Teran 76-1904).

Family CALYPOGEIACEAE

7. Calypogeia (Caracoma) obovata Schust., sp. n.

Species C. amazonicae (Spr.) Schust. similis, differens, autem, ut dentes in apicibus foliorum late dispositi, 2-3 cellulas longitudine; sinus latus, lunatus ad fere planum in fundo; folia in culculis maturis satis obovata, ambobus marginibus plane arcuatis. Type: Estado Merida: Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1485a).

A smaller species than C. amazonica (which is to 3 mm wide), hardly exceeding 1.5 mm wide. A single Frullania-type branch has been seen -- the first instance of such branching in a member of subg. Caracoma.

Family JUNGERMANNIACEAE

Subfam. Lophozioideae

8. Lophozia (Massula) incisa (Schrad.) Dum. subsp. austrigena Schust., subsp. n.

Subspecies subsp. incisae magnitudine parvo, textura succulenta et aspectu similis; propria ut plantae colore fere albidae ad pallide subflavo-virides (numquam viventes colore caesio tinctae); cellulae trigones manifeste tumescentes habentes; folia asymmetrice oblongo-obcuneiformia, 2-3-lobata, duobus lobis dorsalibus valde arctique dentibus confertis spinescentibus. Type: Estado Merida: Sierra de Santo Domingo, 3600 m. (RMS & L. Ruiz-Teran 76-849).

Quite possibly deserving the status of a distinct species, but the type consists of so little material that a definitive decision is hardly possible. However, nothing matching these plants has been seen in any of the hundreds of populations of the nearctic subsp. incisa studied. If actually referable to L. incisa, s. lat., then that species is new to Latin America.

9. Lophozia (Protolophozia) verruculosa Schust., sp. n.

Species L. crispatae Schust. locorum Fuegia et the Distr. of Magallanes dictorum cognata, propria, autem, ut saepissime paroecia (saepe, autem, androecia accessoria habens, tum heteroecia); cuticula verruculosa. Type: Estado Tachira: Paramo de Tama, 3130-3140 m. (RMS & L. Ruiz-Teran 76-1944).

L. verruculosa and L. crispata are identical in facies, yet are abundantly distinct. L. verruculosa has 2- to 2-3-lobed leaves with lanceolate, longly acute lobes, often with gibbous sinuses -- exactly as in L. crispata.

10. Lophozia (Hypolophozia) stolonifera Schust., sp. n.

Plantae virides, repentes; distaliter saepe spadiceae ad castagneas; frequentes ramos ventrales microphyllous et rhizoid-eos stoloniformes habentes; rami foliacei laterali-intercalares. Folia valde asymmetrica, squarrosa, 2-lobata, ambobus lobis spinoso-dentatis; lobi saepe longo-cuspidati. Gemmae ferrugineae, duocellulares, angulato-stellatae. Plantae autoeciae. Os perianthii in multos lobos parvos angustosque divisum, omni lobo in cuspidem longam terminante. Type: Estado Tachira: Paramo de Tama (RMS & L. Ruiz-Teran 76-1950b).

Superficially like L. (Isopaches) bicrenata in the color, size, rust-red and angulate gemmae, and the bisexual inflorescences, and in the toothed σ bracts. Sterile shoots, however, have spinescent squarrose leaves; plants are apparently uniformly autoecious; oil-bodies are uniformly small and also present in the marginal leaf cells.

11. Gymnocoleopsis (Schust.) Schust., gen. n.

Basionym: Gymnocolea subg. Gymnocoleopsis Schust., Bryologist 70:111, 1967.

The single species falling here is Lophozia multiflora St., Spec. Hep. 6:113, 1917 = Gymnocoleopsis multiflora (St.) Schust., comb. n. This has been known only from the type, from Bolivia. Excellent collections were made in a Polylepis sericea bosque, in the Sierra Nevada de Merida, at 4130 m. These show clearly that my evaluation of L. multiflora was overly conservative; I had already noted (Schuster, 1967) that the "species should perhaps be divorced from Gymnocolea entirely." A plate and detailed diagnosis will follow in the succeeding number in this series.

12. Anastrophyllum stellatum Schust., sp. n.

Species a omni alia specie Anastrophylli in America Meridionali antea nota differens ut gemmas stellatas 1-2-cellulares ferruginoso-aurantiacas efficit. Type: Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1900).

The aspect is unique. Shoots are rather frontally flattened, with quite asymmetrically bifid leaves. The presence of rusty-red gemmae is shared with A. minutum (Cr.) Schust., but the gemmae are strikingly stellate; leaves are more asymmetric, with the dorsal lobes much reduced; branches seem to be all lateral-intercalary. Also, leaf cells are linearly oriented and bear very coarse, knot-like trigones; the cuticle is coarsely papillose above.

13. Pseudocephaloziella epiphytica Schust., gen. et sp. n.

Plantae minutae, clare ad hyaline virides (androecia gynoeciaque interdum pigmentationem ferruginoso-rubram habentia). Magni-

tudine aspectuque Cephaloziellae similes. A Cephaloziella differens ut caulis ca. 20-24 ordines cellularum corticearum valde pachydermatarum habet, hae cellulae in medullam pallidiorem membranas firmas habentem abeuntes; amphigastria similia aut paululo minora quam folia lateralialia, bifida similiter ac folia; cellulae minimae, lumina rotundata-angulari (trigones magni ad confluentes, conspicui); membranae radiales, praecipue in marginibus foliorum, dilatatae et "papillam" hyalinam tumidum aut hemisphericam proiectentes; margines foliorum, amphigastriorum atque bractearum ita valde crenulati apparentes. Androecia spicata, bracteis monandris. Gynoecea isophylla subisophyllave, bracteis in aliquot seriebus imbricatis, a se discretis; bracteolae similes, saepe, autem, non lobatae. Perianthium obscure infra partem mediam 3-plicatum, distalter pluriplacatum, ore produnde lobulato, lobis parvis dentatis. Type: Estado Tachira, Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1910e).

Initially believed to be allied to Cephaloziella, but the nontiered cells of the lobulate perianth mouth and the conspicuous trigones of leaf cells clearly suggest these affinities are superficial rather than real. Probably a member of the Lophozioideae, in which it is isolated by the peculiar, Pigafettoa-like leaf cells, with hyaline tumidities produced from the intersections between cells. The larger shoots are almost or quite isophyllous -- a condition previously unknown in Lophozioideae. Equally unique, if the plant truly belongs in the Lophozioideae, is the isophyllous to subisophyllous gynoeceium.

Subfamily JUNGERMANNIOIDEAE

14. Lophonardia Schust., gen. n.

Plantae taxis Lophoziae (s. lat.) et Nardiae similes ut folia bilobata, lobis obtusis ad rotundatos; ut rami typi Frullaniae, hemiphyllum dorsalem ovatum habentes, regulariter obventes; necnon ut rhizoidea dispersa. Genus ab ambobus generibus proprium insertione foliorum, foliis in arcum apertum insertis, basi folii manifeste cava, sacculum basalem non profundum efficiente; folia verticalia, remota, non profunde bilobata mollia laxaque, aspectu atque orientatione Marsupellae similia. Type (and only) species: L. caespitosa Schust., sp. n. Estado Merida: Sierra Nevada de Merida, in a Polylepis bosque at 4150 m. (RMS & L. Ruiz-Teran 76-1458).

Although with a Marsupella-like aspect because of the form and vertical orientation of the leaves, it is distinct from all Gymnomitriaceae in that leaves are inserted merely to the stem midline antically and in the Frullania-type branches. Although perhaps to be placed in the Lophozioideae, rather than Jungermannioideae, it is distinct from all Lophozioideae known to me in the following ensemble of criteria: soft-textured stem, lacking

cortical differentiation, with all cells leptodermous, lacking mycorrhizal infection; the leptodermous leaf cells; lack of asexual reproduction; no appendages, even vestigial, of the ventral side of the stem. Although the first 3 criteria occur in Nardia, the last -- plus the leaf orientation -- suggests that placement there would be unsuitable.

15. Jamesoniella autumnalis (DC) St.

This well-known holarctic taxon has not been previously known from Latin America. Typical plants are from: Estado Tachira: Paramo de Tama, 2550 m. (RMS & L. Ruiz-Teran 76-2086).

Family GEOCALYCEAE

16. Platycaulis Schust., gen. n.

Plantae robustae, erectae, brunneae, cacuminibus surculorum clare viridibus, maxime lateraliter compressae complanataeque, raro ramosae; rami laterali-intercalares et typi Frullaniae; caulis filo metallico similis, cellulis corticalibus rectangularis (4-7:1), atque pachydermatis; folia alterna, natura plana, reniformia lataque (1.5-2:1), valde erecto-appressa; amphigastria a foliis discreta, parva, 0.75-0.85 bifida; rhizoidea in fasciculis a basibus amphigastriorum orientia; cellulae trigones crassos habentes; cuticula valde papillosa. Plantae dioeciae; gynoeceia (rara) ♂ bracteas foliiformes atque innovationes binas subflorales habentia. Type (and only) species: P. renifolia Schust., sp. n. Estado Tachira: Paramo de Tama (RMS & L. Ruiz-Teran 76-1902b).

An extraordinary plant, with the aspect, color, and vigor of a large Adelanthus -- especially since it is almost unbranched above. The exact affinity remains problematic: color, the fasciculate rhizoids and distinct bifid underleaves, as well as the laterally compressed (single and putative, very juvenile) gynoeceium suggest Leptoscyphus. Axial anatomy, with elongated cortical and strikingly elongated medullary cells, seems distinctive; so does the leaf insertion which fails to attain the stem midline.

17. Lophocolea (subg. Fragilifolia) fragmentissima Schust., subg. et sp. n.

Plantae minutae repentes, laxae caespitosae, epiphyticae, subflava; rami remoti, normaliter typi Frullaniae; folia remota, facile caduca, in lineam constrictam fere transversam inserta, adaxialiter a valde concava ad squarrosa, a caule rigide patentia, obdeltoidea ad angusto-obtrapezoidea, 0.55-0.6 bifida; lobi triangulari-lanceolati, acute ad obtuse acutos, latibus fere rectis. Amphigastria 0.4-0.55 magnitudinis foliorum, bifida, dente parvo uno in latere interdum praedita. Plantae dioeciae. Gynoeceia in caulibus terminaliter sita; perianthium urceolatum, ad os late

apertum, leve atque inflatum (plerumque omnino sine angulo alisve), os trilobatum, omni lobo non profunde bilobato.

Type: Estado Merida: Sierra de Santo Domingo, near Laguna Grande, 3600 m. (RMS & L. Ruiz-Teran 76-864b).

Somewhat like a hypothetical cross between the New Zealand Lophocolea amplexans and a Cephaloziella ! The very freely caducous leaves -- a mode of asexual reproduction not before noted in any Geocalycaceae (s. lat., to include Lophocoleaceae) -- suggest that perhaps subg. Fragilifolia ought to be given the rank of an autonomous genus. This, however, should await knowledge of the ♂ plant and sporophyte.

18. Lophocolea cuspidata (Nees) Limpr.

Estado Tachira: Villa Paez, 2550 m. (RMS & L. Ruiz-Teran 76-2088). New to South America! The recent treatment of Lophocolea in Fulford (1976) fails to cite this as a Latin American species; however, the present plants are quite typical. They occur admixed with Blepharostoma trichophyllum -- another species (and genus) regarded as "absent" from Latin America by Fulford.

19. Leptoscyphopsis Schust., gen. n.

Genus Leptoscypho cognatum ut unisexuale ut insertionis foliorum sucubus, anticaliter ad lineam caulis mediam; ut perianthium ad apicem caulis primarii inflatum, ore late bilabiato, labiis rotundatis dentatisque; carina nec dorsalis nec ventralis alata. Genus a Leptoscypho distinctum ut basis surculi microphylla, ut stolona (combinationem quae Plagiochilae similis est surculorum et microphyllorum et folia normalia habentium) adsunt; merophyta ventralia angustissima, etiam in gynoeceo, amphigastriis solum e 1-2(3) cilliis brevibus, ad basim vix connatis constantibus. Type: L. paradoxus Schust., sp. n. The diagnosis may serve as a descriptio specifico-generica. Type: Estado Merida: Above Loma Redonda, Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1450a).

Distinctive in the: ventral + lateral-intercalary branches, microphyllous at the base; oblong leaves, + flat, soft-textured, rather nitid, truncate to bidentate at the apex; smooth cells with rather bulging trigones, each with (8)9-15 rather large, smooth, essentially homogeneous oil-bodies largely obscuring the cell lumen. Its position within the Leptoscyphus alliance is uncertain; the microphyllous branches and stolons suggest Plagiochila, yet the genus is very different in aspect, in the soft texture, lack of cnemis, and largely creeping mode of growth. In drying, plants tend to blacken -- a Lophocoleoid character never seen in Plagiochilaceae.

Family PLAGIOCHILACEAE20. Plagiochila caducidentata Schust., sp. n.

Species P. caducilobae Blomquist in montibus Southern Appalachian dictis repertae cognata (ut partes distales foliorum facile caducae); propria ut folium angustius, obovatum ad interdum ovatum, non lobatum; margines folii ca. 6-12 dentibus caducis, uniseriatis nisi ad basim praediti. Type: Estado Merida: Cloud forest at 2650 m. below Rio Frias, Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1515).

As in P. caduciloba, branching is wholly lateral-intercalary; oil-bodies are usually homogeneous, 6-7(8) per cell. Diagnostic of this species is the androecium: erect, unbranched, leafy axes may produce a spicate, tapered androecium, at which point the shoot apex becomes arched and the apical sterile innovation (of strictly limited growth) may grow down toward the substrate; at the androecial base this is almost invariably a vigorous sterile innovation overtopping the androecium and "seemingly" deflecting the androecium to one side.

21. Plagiochila moniliformis Schust., sp. n.

Plantae minutae, axibus foliaceis essentialiter non ramosis, folia minutissima verticalia subverticaliave habentibus; folia natura bilobata, discum cuniiformi-obtrapezoideum atque duos lobos parvos ramosos praebentia--ramis tantummodo ordinibus cellularum moniliformium quae singulatim (aut interdum cellulis binis ternisque) dehiscunt. Type: Estado Tachira: Below Paramo de Tama, 2790 m. (RMS & L. Ruiz-Teran 76-1972).

This and the preceding species both bear essentially homogeneous oil-bodies and show asexual reproduction by dropping fragments derived from leaf teeth or lobes -- hence belong in the Bidentes (s. lat.). P. moniliformis is unique in that section, and, indeed, in the genus Plagiochila because of its minute size, linked with asexual reproduction by 1-celled, thick-walled gemmae produced by dehiscence from moniliform cell rows that terminate the primary lobes and secondary leaf "lobes" (or teeth).

22. Rhodoplagiochila Schust., gen. n.

Genus Plagiochilae cognatum, proprium, autem, et cacumina surculorum pigmenta membranae typi "anthocyanin": rosea ad subpurpurea praebentia; insertio foliorum utra lineam caulis mediam anticaliter extensa, insertionibus foliorum dorsaliter implicatis; proprium necnon folia lateraliter apressa, omnino sine margine folii anticali deflexo, necnon folium non profunde 3-4-lobatum, ciliis marginalibus nitidis, flavo-brunneis, valde elongatis atque fere seriaceis, armatum. Type: R. rosea Schust., sp. n.; monotypic.

Type: Estado Merida: Sierra de Santo Domingo, in cloud forest above Laguna de los Patos, 3700-3750 m. (RMS & L. Ruiz-Teran 76-901).

Because of its erect growth, circinate-decurved shoot apices and strikingly laterally compressed shoots, initially believed (in the field) to be a member of the Adelanthaceae. Yet reddish pigments are unknown in Adelanthaceae (s. str.; Odontoschisma does not belong in that family). The laterally compressed shoots and lack of a deflexed fold of the antical leaf margins suggests Acrochila and Plagiochilion, yet the lateral-intercalary stolons and lateral-intercalary leafy branches and innovations (aside from a single Frullania-type branch seen) suggest no close affinity to these two genera is possible. In neither of them, nor in any other genus of Plagiochiloideae, has anthocyanin pigmentation ever been seen; nor have interlocking dorsal merophyte margins been seen in any other member of the Plagiochilaceae.

Family SCAPANIACEAE

23. Diplophyllum andicolum Schust., sp. n.

Plantae dioeciae, dilute virides ad castaneas, basibus ventralibus, autem, foliorum subrubris. Propriae lobis dorsalibus foliorum longe attenuatis necnon gemmis unicellularibus, colore subrubra-brunneis. Type: Estado Merida: Sierra Nevada de Merida, 4160 m. (RMS & L. Ruiz-Teran 76-1432).

The reddish coloration of ventral leaf bases and the pigmented gemmae suggest the D. domesticum-obtusifolium-obtusatum complex, but the plants are abundantly different in being dioecious, and in the strikingly drawn out, lanceolate-acuminate, often somewhat caudate dorsal lobes.

Family GYMNOTRIACEAE

24. Marsupella (subg. Nanomarsupella) xenophylla Schust., subg. et sp. n.

Genus ab omni alio taxo Marsupellae (s. lat.) distinctum ut cellulae foliorum singulatim tumidae, omni papilla saliente alta pachydermata armata; surculi foliacei pumili, repentes, ob ramos laterali-intercalares abbreviatis pinnulati; gynoeceia capitata "germen" apicale abrupte discretum formantia; folia imbricata sed minuta, squamaformia. Type: Estado Merida: Sierra Nevada de Merida, 4160 m. (RMS & L. Ruiz-Teran 76-1449).

The above diagnosis is a descriptio generico-specifica. This dwarf, easily overlooked plant is mostly subterranean, consisting of a massive system of very long, leafless, geotropic stolons from which the slight, somewhat dorsiventrally flattened, stoutly wiry,

creeping "aerial" shoots arise. Such leafy axes are of limited growth and tend to go over abruptly into relatively large, "bud-like" terminal structures. These are putative gynoecea, formed of 2-3 pairs of tightly imbricate, paired bracts. No perianth or archegonia could be found, however, and it is not impossible -- but unlikely -- that these structures represent aborted androecea. The uniquely armed leaf cells, much as in Pigafettoa of the Geocalycaceae, are unique. Possibly forming an autonomous genus.

25. Marsupella (Stolonicaulis) microphylla Schust., sp. n.

Plantae minutae, folia minuta, maxime remota, squamaformia habentes tamquam in M. stoloniforme (in loco Borneo, N. Guinea dicto reperta), propriae ut coloratio admodum subrubra; φ bracteae erectae, lobos patentes, lanceolati-triangulares habentes, necnon folia patentia ad squarrosa, ad 0.5 bifida. Type: Estado Merida: Sierra Nevada de Merida, ca. 4160 m. (RMS & L. Ruiz-Teran 76-1429a).

Because of its bifid leaves I have placed this plant into Marsupella subg. Stolonicaulis Kitagawa, rather than into Poeltia Grolle. Poeltia, however, probably should be reduced to a subgenus of Marsupella -- since the lack of leaf emargination seems to be its only claim for generic rank. The seta has 8 epidermal + 3(4) internal cell rows. If this proves to be constant for other taxa of the Stolonicaulis-Poeltia complex, then generic segregation from Marsupella may prove necessary.

Family ACROBOLBACEAE

26. Acrobolbus (Xenopsis) laceratus Schust., subg. et sp. n.

Plantae in ramunculis epiphyticae, albido-virides nisi caulibus subbruneis, filo metallico similibus. Caules rigidi, ca. 7 cellulas diam., corticem 1-stratosum e cellulis maxime pachydermatis et valde elongatis compositum habentes. Folia valde deflexa ventraliter mutuo attingentea aut superposita (sectio surculi ita tubularis), oblonga ad oblongo-cuneata, fragilia bisbifida, lobis fractis. Cellulae elongatae (2-3:1 vel magis in basibus foliorum), trigones crassos longitudinaliter confluentes habentes. Type: Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1910a).

The most extraordinary species known of Acrobolbus and so isolated from that genus that separate generic status may become unavoidable when the reproductive structures are known. Differing from all other taxa in the genus in the strikingly elongated stem and leaf cells, the bisbifid leaves, and the fragmenting leaf lobes.

27. Marsupidium latifolium Schust., sp. n.

Plantae erectae, caulibus subbruneis, filo metallico simili-

bus, interdum distaliter microphyllis; cellulae corticales lineares; bases surculorum flagellis atque stolonibus geotropicis praeditae. Folia chlorophyllosa, subtransverse orientia, patelliformia ad admodum concava, late elliptico-reniformia, basibus angustissimis, margine integro, cuticula levi. Type: Estado Tachira: Paramo de Tama, 3100 m. (RMS & L. Ruiz-Teran 76-1940c).

The genus has been known, in America, only from the subantarctic Nothofagus zone. Among American taxa perhaps allied to M. urvilleanum, but in that species leaves are typically pluridentate. Possibly also allied to M. renifolium (Hassel & Solari) Schust., comb. n. [Basionym: Tylimanthus renifolius Hassel & Solari, Darwinia 17:583, 1972].

Family ADELANTHACEAE

28. Adelanthus aureomarginatus Schust., sp. n.

Plantae marginem folii aureum, nitidum, denticulato-serrulatum, a lamina folii viridi insigne discrepantem, praebentes, folium ovato-rotundatum ad rotundatum, concavum, patelliforme, multis dentibus parvis acutis spinosisque verticaliter orientibus praeditum. Cellulae marginales in 2-3(4) seriebus ordinatus, inflatae, admodum pachydermatae; cellulae intramarginales parvae, membranas firmas habentes. Type: Estado Merida: Sierra Nevada de Merida, ca. 2000 m. (RMS & L. Ruiz-Teran 76-1620).

Unique within the genus in the extraordinarily well-defined border of nitid, thick-walled cells from which arise numerous spinous (1)2-celled teeth formed of thick-walled cells; the intramarginal cells are smaller, slightly but evenly thick-walled, isodiametric, and grade into a basal field of larger, firm-walled cells that are little (1.8-2.5:1) elongated. The marginal teeth are ca. 48-55 per leaf and extend over the entire margin, except at the very base.

29. Adelanthus decipiens subsp. aureocinctus Schust., subsp. n.

Subspecies subsp. decipienti similis ut folia (normaliter) bispinulosa et suborbicularia; os perianthii setuloso-ciliatum; cellulae folii admodum collenchymatosae, trigones crassos habentes. Distinctae ut variatio in unico surculo, inter folia bispinulosa atque folia (spina una vel utraque suppressa); distinctum necnon limbus aureus nitidus et singulari ordine cellularum satis amplificatarum, membranas crassiores habentium formatus; necnon spinae folii rigidae pachydermataequae, e 1-3 cellulis perelongatis (4-8:1) formatae. Type: Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1910).

Similar to the preceding in the nitid, golden border -- conspicuous under both hand lens and the dissecting microscope. The

border is less marked, however, and only 1 cell wide; cells, including the firm-walled marginal ones, bear coarse trigones.

The A. decipiens complex, including A. crossii, is only perfunctorily and unsatisfactorily treated in Grolle (1972). The present plant keys out between these two taxa in his treatment; no mention is made of the form and dimensions of the apical spines and their cells, nor is mention made of the development -- if any -- of a differentiated border. It is likely the present plant may prove to be an autonomous species, but it is equally possible that A. crossii will need reduction to subspecific status under A. decipiens. More material will need to be critically studied to elucidate this malleable complex.

FOOTNOTE

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ADDITIONAL NOTES ON THE GENUS LIPPIA. IX

Harold N. Moldenke

LIPPIA MYRIOCEPHALA Schlecht. & Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 182. 1978.

The corollas are said to have been "pale-yellow" on Molina & al. 16989. Molina refers to the species as "frequent in mixed woods" in Honduras.

Gibson (1970), on page 211 of her work, reduces L. hypoleia Briq., L. myriocephala var. integrifolia Loes., and L. hypoleia var. ovatifolia Moldenke to synonymy under typical L. myriocephala, but on page 209 of the same work she also reduces the last-mentioned taxon to L. cardiostegia. She asserts that L. myriocephala, in her circumscription of it, inhabits "Wet or dry, often rocky thickets, open hillsides, outer slopes of cloud forest, often in pine-oak forest".

Vernacular names reported for L. myriocephala include "ánamte", "asniche", "barba de chivo", "cutujume", "oreganillo", "palo de gusano", "palo seco", "sacataum", "salvia", "tamayagua", and "tatascamite".

Arthur (1918) reports Prospodium lippiae as a fungal parasite on Lippia myriocephala in Costa Rica, based on Holway 372, but the Puccinia latipes which he also reports from it in Guatemala, based on Holway 307, is actually on L. costaricensis Moldenke, as I have determined by an examination of the host material. He describes Prospodium elatipes and P. permagnum from L. myriocephala in Belize (based on Bartlett 11503), Guatemala (Holway 678 & 831), and Costa Rica (Holway 404) and P. lippiae from Costa Rica and Guatemala (Holway 372 & Kellerman 5451). Kern (1911) found Puccinia lippiae on what he took to be Lippia myriocephala in Guatemala, but the host here again was misidentified - it is actually L. callicarpaefolia H.B.K.

It is worth quoting the original description of L. myriocephala here: "Foliis elliptico-lanceolatis, breviter petiolatis, obsolete serratis, supra scabrido-hirtellis glabrescentibus, subtus (in rete vasculoso) puberulo-hirtellis; penninerviis, nervo venisque supra leviter impressis; reticulo-venosis, rete subtus prominente: capitulis globosis axillaribus subquinis fasciculatis, pedunculis filiformibus folio dimidio brevioribus; bracteis ovatis, acuminatis, acutis, patulis, puberulis. — Rami tetragoni, pubescentes. Folia inferiora maxima, cum petiolo sexpollicaria, latitudine bipollicaria. Capitula magnitudine grandi piperis. — In sylvis Jalapensibus. Oct."

Standley (1924) reduces to synonymy under L. myriocephala both L. hypoleia Briq. and L. myriocephaloides Briq. without question

and L. jurgenseni Briq. and L. yucatanæ Loes. with a question. I regard L. jurgenseni as a synonym of L. pringlei Briq. and L. yucatanæ as a valid species; the other two names I regard as belonging to L. myriocephala var. hypoleia (Briq.) Moldenke. Standley records what he regards as L. myriocephala from San Luis Potosí, Veracruz, Oaxaca, and Chiapas, as well as from Guatemala and El Salvador. He says: "Type material collected near Jalapa and Papamtlá, Veracruz.....Shrub or tree, 3 to 9 meters high; leaves short-petiolate, lanceolate or lance-oblong, 6 to 19 cm. long, usually long-acuminate, acute to attenuate at base, scaberrulous or smooth above, sparsely puberulent or glabrate beneath or sometimes tomentose, entire or finely serrulate; heads numerous, on long, slender peduncles, globose or somewhat elongate, 5 to 7 mm. thick; flowers lilac.....Lippia yucatanæ was described from Yucatán. The writer has seen no Yucatán specimens of L. myriocephala, and it may therefore be that L. yucatanæ is a distinct species, or possibly a synonym of L. umbellata." In his 1938 work he reports L. myriocephala from San José and Guanacaste, Costa Rica, inhabiting thickets and "ranging to Mexico". He admits, however, that "A good many Costa Rican collections have been referred to this Mexican species, but I have seen only two that seemed properly referable here, and those I am unable to distinguish from the typical form. It may be, however, that careful study will show that the collections I have placed here are properly referable elsewhere." I have seen no specimens at all from any province of Costa Rica except Alajuela which I regard as representing the true L. myriocephala.

Loesener (1912) records L. myriocephala from the edge of woods in Veracruz, with whitish flowers in December, on the basis of Seler 3649.

Material of typical L. myriocephala has been misidentified and distributed in some herbaria as L. hypoleia Briq. On the other hand, the Heithaus 474, Herb. Nat. Costaric. 13215, Heyde & Lux 4385, Pittier 7519, and Tonduz & Biolley 7218, distributed as L. myriocephala, actually are L. cardiostegia Benth., Lent 721 is L. costaricensis Moldenke, Bourgeau 1471 & 2983, Contreras 5446, Jiménez M. 1520, Kelly 241, Lems 65012 (01-08) 02, Lent 1097, Liebmann 11273, Molina R. 11277, 11330, 11745, 13556, & 25994, Molina R. & Molina 21489, Molina R. & Montalvo 21532, Molina R. & Williams 20107, Molina R., Williams, Burger, & Wallenta 16989, Ortiz 868 & 2217, Pringle 3277, Rzedowski 15566 & 18956, Seymour 3405, C. L. Smith 1076, Williams & Molina R. 20107 & 42545, Williams, Molina R., & Williams 23418, Williams, Molina R., Williams, Gibson, & Laskowski 27518, Williams, Molina R., Williams, & Molina 42907, and Williams, Williams, Molina, Gibson, & Laskowski 27707 are L. myriocephala var. hypoleia (Briq.) Moldenke, and Tucker 793 is L. myriocephala var. integrifolia Loes.

Additional & emended citations: MEXICO: Chiapas: Breedlove 23258 (Ld, Mi, N); F. Miranda 5720 (W—2508375), 7062 (W—2508426); Raven & Breedlove 20118 (Ip). Jalisco: R. McVaugh 21511 (Mi, N, W—2452597). San Luis Potosí: Roe & Roe 2330 (Ac, W—2516405, Z); J. Rzedowski 8345 (Au—237992, Ip). Tabasco: González L. & Perez J. 3934 (Ws). Tamaulipas: J. R. Sullivan 752 (Ld); Webster & Webster 98 (Au—237211), 226 (Au—242425). Veracruz: Sousa 2849 (Mi, W—2634581). GUATEMALA: Alta Verapaz: Türckheim 7933 (Mu—3976); Williams, Molina R., Williams, & Molina 43204 (W—2735603). EL Petén: Tún Ortiz 563 (Ld). Huehuetenango: Iltis & Lind G. 115 (Ac, Ld, Ws). San Marcos: Williams, Molina R., Williams, Gibson, & Lasowski 27127 (N, W—2537914, Ws). Santa Rosa: Heyde & Lux 4386 (Mu—17650), 4388 (Mu—1809). HONDURAS: Copán: Record & Kuylen G. 90 [Herb. Mus. Yale School Forest. 10041] (N). Morazán: Molina R., Williams, Burger, & Wallenta 16989 (N). EL SALVADOR: Santa Fé: Molina R., Burger, & Wallenta 16942 (N). NICARAGUA: Matagalpa: Williams & Molina R. 20107 (N). COSTA RICA: Alajuela: Molina R. 13556 (Ld, N).

LIPPIA MYRIOCEPHALA var. *HYPOLEIA* (Briq.) Moldenke, Phytologia 27: 66. 1973.

Synonymy: Lippia hypoleia Briq., Ann. Conserv. & Jard. Bot. Genève. 4: 236—237. 1900. Lippia myriocephaloides Briq., Ann. Conserv. & Jard. Bot. Genève. 4: 235—236. 1900. Lippia hypoleuca Briq. ex K. Schum. in Just, Bot. Jahresber. 28 (1): 496. 1902. Buddleia bracteolata Kränzl., Bull. Jard. Bot. Petersb. 13: 90—94. 1913. Buddleja bracteolata Kränzl. ex Moldenke, Résumé 240, in syn. 1959. Lippia pycnocephala Schlecht. ex Moldenke, Résumé Suppl. 18: 13, in syn. 1969. Lippia pycnocephala Seem. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Bibliography: Briq., Ann. Conserv. & Jard. Bot. Genève. 4: 235—237. 1900; K. Schum. in Just, Bot. Jahresber. 28 (1): 496. 1902; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 106. 1904; Prain, Ind. Kew. Suppl. 3: 104. 1908; Kränzl., Bull. Jard. Bot. Petersb. 13: 90—94. 1913; Prain, Ind. Kew. Suppl. 5, imp. 1, 36. 1921; C. L. Lundell, Carnegie Inst. Wash. Publ. 478: 45, 75, 135, 137, 183, 194, & 203. 1937; Moldenke, Alph. List Common Names 10 & 29. 1939; Moldenke, Carnegie Inst. Wash. Publ. 522: 164, 168—169, 219, & 221. 1940; Moldenke, Prelim. Alph. List Inv. Names 31. 1940; Moldenke, Suppl. List Common Names 14. 1940; C. L. Lundell, Contrib. Univ. Mich. Herb. 8: 61. 1942; Moldenke, Alph. List Inv. Names 31. 1942; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 1], 17, 20, 21, & 95. 1942; Moldenke, Phytologia 2: 107. 1945; Moldenke, Alph. List Cit. 1: 5, 32, 33, 38, 53, 194, & 246. 1946; Moldenke, Phytologia 2: 330 & 384. 1947; Moldenke, Alph. List Cit. 2: 327, 329, 335, 467, 468, & 607 (1948), 3: 676, 677, 697, 714, 757, 829, 830, 833—835, 842, 946, & 973 (1949), and 4:

1013, 1180, 1227, 1244, 1294, & 1295. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 1], 31, 35, 36, & 190. 1949; F. Miranda, Veg. Chiapas 1: 287—288 (1952) and 2: 363. 1953; Moldenke, Résumé 37, 42, 43, 240, 315, & 461. 1959; Prain, Ind. Kew. Suppl. 5, imp. 2, 36. 1960; F. Miranda, Bol. Soc. Bot. Mex. 26: 143 & 148. 1961; Moldenke, Résumé Suppl. 3: 11 (1962), 4: 4 (1962), and 8: 4. 1964; Moldenke, Phytologia 12: 111, 190, 213—216, & 302 (1965) and 13: 34, 162, 356—357, & 362. 1966; Hocking, Excerpt. Bot. A. 11: 103. 1966; Moldenke, Résumé Suppl. 13: 1 (1966) and 14: 1 & 2. 1966; Hocking, Excerpt. Bot. A. 12: 424. 1967; Moldenke, Résumé Suppl. 15: 3. 1967; Moldenke, Phytologia 14: 217, 407—408, & 419. 1967; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke, Résumé Suppl. 17: 2. 1968; Gibson, Fieldiana Bot. 24 (9): 211. 1970; Moldenke, Fifth Summ. 1: 72, 80, 82, 83, 85, 86, 88, & 402 (1971) and 2: 557, 560, 564, & 892. 1971; Moldenke, Phytologia 23: 414 & 415 (1972), 25: 227 (1973), 27: 66 (1973), and 28: 431—433, 454, 459, & 460. 1974; Moldenke, Biol. Abstr. 57: 3780. 1974; Hocking, Excerpt. Bot. A. 26: 5. 1975; Moldenke, Phytologia 31: 378 (1975), 34: 253 (1976), 36: 44 (1977), and 39: 27 & 87. 1978.

Recent collectors describe this plant as a small or large, weak, bushy tree, 3—50 m. tall, aromatic, "very glutinous", with a pleasantly spicy-lemon smell, or a large, weak, arborescent shrub, 2—6.7 m. tall, the stems 8—80 cm. in diameter, the flower-heads "lavender" (Lundell 17630), and the fruit dry, green, 2 mm. in diameter. They have found it growing along small creeks, on lake shores and gypsum cliffs, in black sandy soil or the sandy soil of savannas and tropical evergreen forests, in oak woods, Liquidambar woods, secondary pine woods, and mostly small woodlots of mixed subtropical forest, on cutover hills, in rainforests on mountainsides, in secondary vegetation, montane and cloud forests, low or open forests, and pine-oak forests, in shrubby areas, old lumber clearings, clearings bordering secondary rainforests, and high evergreen forests, at altitudes of 6—2300 meters, flowering from July to March, and fruiting from September to April. Rosas refers to it as abundant and Lundell as a common pioneer tree. Fosberg found it "occasional in thickets in brushy open woods, mainly Taxodium, the soil formed from limestone". Bartlett reports it from "secondgrowth on 'cohune' ridges", while Raven & Breedlove encountered it on slopes with Quercus, Pinus, and Liquidambar. Breedlove found it growing on "moist gradual slopes with Quercus, Pinus, Nyssa, and Liquidambar", Rzedowski on "ladera caliza" and in Quercus, Liquidambar, and Clethra woods, and Ton on "steep heavily wooded slopes with Quercus" or with Quercus, Dodonaea, and Calliandra or with Pinus chiapensis and Liquidambar. Nevling & Gómez-Pompa found it "abundant in oak woods", Williams and his associates "common in forests, at edges of clearings, and in cloudforest areas", and Molina "frequent in mixed wet forests", "common in open forests", and "common in cutover mixed forests". Molina & Montalva report it "common in cloudforests", while Rosas says: "aroma 9.30 hs.,

sin latex y sin resina...Regular abundancia de piedras".

The corollas are said to have been "white" on Bartlett 11503, Breedlove 14894, Breedlove & Thorne 20947, Contreras 10257, Fosberg 29459, Molina R. 11277 & 11330, Molina & Montalvo 21532, Ortiz 2217, Raven & Breedlove 19816, Roe & Roe 2218, Rzedowski 24496, Ton 3296 & 3441, and Williams & al. 27518, "white-cream" on Jiménez M. 1520, "white-reddish" on Contreras 5446, "whitish with mustard-color eye" on Lundell 17632, "cream" on Martínez Calderón 1211, "cream-white or whitish-cream" on Rosas R. 56, "creamy-yellow" on Breedlove & Raven 13603, "yellow" on Lent 1097, "pale-yellow" on Molina & al. 16989 and Williams & al. 27707, "yellowish" on Molina & Molina 21489 and Williams & al. 42907, "yellowish-green" on Williams & al. 23418, "pale yellow-green" on Williams & al. 40683, and "greenish" on Molina R. & Williams 20107.

Vernacular names reported for this variety are "askutkiwi", "palo de gusano", "tabaquillo", and "tah". Gibson (1970) reduces this variety to synonymy under typical L. myriocephala Schlecht. & Cham. Kelly reports its use by Totonac Amerinds as "la madera se emplea para vigas de la casa".

Material of this taxon has been identified and distributed in some herbaria as L. callicarpaefolia H.B.K., L. floribunda Briq., L. graveolens H.B.K., L. myriocephala Schlecht. & Cham., L. umbellata Cav., and Lantana sp. On the other hand, the Breedlove 23258, González L. & Pérez J. 3934, McVaugh 21511, and Roe & Roe 2330, distributed as L. hypoleia, actually are typical L. myriocephala Schlecht. & Cham., while Alava & Cook 1616 is L. pringlei Briq.

Additional & emended citations: MEXICO: Chiapas: Breedlove 6201 (Ac), 7376 (Ac), 7643 (Ac), 13968 (Ld, Ld), 14894 (W—2544783, Ws), 26516 (Ld), 28138 (Ld); Breedlove & Raven 13603 (Ac, N, W—2590013), 13615a (Ac, Ld); Breedlove & Thorne 20947 (Ld, N); Lathrop 5055 (Qa); Matuda 3630 (A, N, N), 5300 (Ld); Raven & Breedlove 19816 (Ac, W—2574721), 19948 (Ac); Ton 1724 (N), 1784 (Mi, N), 3296 (Ld, Mi), 3441 (Mi), 3692 (Ws). Hidalgo: González Quintero 1553 (Ac), 1617 (Ac); H. E. Moore 2000 (Ba); Weber & Charette 11939 (Bl—176243, Du—498875). Nayarit: Breedlove & Gregory 14215 (Ld). Oaxaca: Galeotti 770 (Br—cotype); Janzen s.n. [13 January 1964] (Mi). Puebla: González Quintero 289 (Ld); Paray 2801 (Ip). San Luis Potosí: F. R. Fosberg 29459 (Ld, W—2747155); Kenoyer s.n. [Valles, 9-3-38] (Fs); Edw. Palmer 1137 (G, Io, Pa, Pa); Pringle 3277 (A, Br, C, Ca—104906, Cm, Es, G, Ld, Me, Me, Mi, Mm—15411, Ms—30876, Mu—1764, Ob—50729, Pa, Po—63854, S, Vt, W—42738); Roe & Roe 2218 (W—2516406, Z), 2304 (Ld); J. Rzedowski 6906 (Au, Ip), 15566 (Ip), 24496 (Ld). Tamaulipas: M. B. Webster 203 (Au—244480). Veracruz: Balls B.5489

(Ca—684285); Beaman 6429 (Ld); Berlandier 2159 (G, T); Botteri 881 (G, G, S); Botteri & Sumichrast 1730 (Mi); Bourgeau 401 (Mi), 1471 (Br, G, Mi, S, W—2546646), 2983 (Br, C, G, Mi, Mu—1199, S, S); Dressler & Jones 190 (Ca—48876, G, Mi, N); Ervendberg 288 (G, T); Galeotti 752 (Br—cotype); J. M. Greenman 274 (G, N); Gutiérrez R. s.n. [26/XII/1967] (Ld, Ws); L. C. Higgins 2567 (Mi, N); I. Kelly 241 (Ba); N. L. H. Krauss 858 (W—2367811); Liebmann 11273 (Ba); MacDaniels 354 (Ba); Marino Rosas R. 56 (Ca—1323957, Ip, Mi, W—2516714); Martínez Calderón 1211 (N); C. Mohr s.n. [Sept. 1857] (W—771834); Nevling & Gómez-Pompa 2140 (Ac); Paray 2892 (Ip); Pringle 11668 (Fs, G, Gg—421286, It, Ld, Me, Me, Mi, Vt, W—461126); Purpus 421 (Ca—104929, Po—64306), 2254 (Du—77084, G, N, Tu), 5751 (A, Ca—163122, G, N), 8648 (Ca—208397, G, N), 14091 (A, Mi, W—1638300), 14093 (Ca—429028); Rosas R. 715 (Ld), 1366 (Ac), 1445 (Ld); J. Rzedowski 12157 (Ac), 18956 (Au—243512, Ip, Mi); C. L. Smith 1076 (Ba, Ca—975392, G, Mi, N, N, N, Tl, Vt, Ws); Taylor & Taylor 7277 (N). State undetermined: Karwinski 696 (Z, Z—photo). GUATEMALA: Alta Verapaz: Türkheim II.1474 (S). Baja Verapaz: Williams, Molina R., Williams, & Molina 40683 (N). Copán: Record & Kuylen G.90 [Herb. Yale Mus. Forest. 10041] (N). El Petén: Aguilar Hidalgo 394 (I, Mi, N); Contreras 2034 (Au—228043, Ld, S), 5446 (N), 9641 (Ld, Ld), 10357 (Ld, Ld); C. L. Lundell 2119 (Mi, S), 2599 (Mi, Mi), 2780 (Mi, S, W—1635185), 3171 (F—714093, Mi, S), 17256 (Au—228040, Ld, Ld, S), 17630 (Au—278475, Ld, W—2558707), 17632 (Au—278476, Ld), 17927 (Au—278483, Ld, Ld); Ortiz 868 (N), 2217 (N, W—2650574). San Marcos: J. A. Steyermark 36722 (F—1053464). BELIZE: H. H. Bartlett 11503 (Du—266231, F—665423, Gg—233411, Mi, W—1585943), 13008 (Ca—72670, F—659101, Mi); Proctor 30259 (Ld). HONDURAS: Comayagua: Molina R. 25994 (N, W—2633302). Copán: Molina R. 11745 (Ld, N); Williams, Molina R., Williams, & Molina 42907 (N). El Paraíso: Molina R. 11330 (N, W—2445228). Morazán: Molina R. 10260 (Ld), 11277 (N, W—2445592); Molina R. & Molina 21489 (N); Molina R., Williams, Burger, & Wallenta 16989 (W—2566852). EL SALVADOR: San Salvador: M. C. Carlson 430 (Ca—703550), 431 (Ca—703549). Santa Ana: Molina R. & Montalvo 21532 (N). NICARAGUA: Chontales: F. C. Seymour 3405 (E—2105975, N). Esteli: Atwood A.321a (Ld). Matagalpa: Molina R. 20107 (W—2566655); Molina R. & Williams 20107 (Ws); Williams & Molina R. 42545 (W—2735516); Williams, Molina R., & Williams 23418 (N, W—2537720, Ws); Williams, Molina R., Williams, Gibson, & Laskowski 27518 (N, W—2537719, Ws); Williams, Williams, Molina, Gibson, & Laskowski 27707 (Tu—165133). COSTA RICA: Cartago: Lent 1097 (N). Guanacaste: Jiménez M. 1520 (N, W—2751894). San

José: Lems 650122 (01-08) 02 (N).

LIPPIA MYRIOCEPHALA var. **INTEGRIFOLIA** Loes.

Additional bibliography: Hocking, Excerpt. Bot. A.10: 271. 1966; Moldenke, Phytologia 13: 362. 1966; Moldenke, Résumé Suppl. 16: 3. 1968; Gibson, Fieldiana Bot. 24 (9): 211. 1970; Moldenke, Fifth Summ. 1: 80, 83, & 85 (1971) and 2: 893. 1971.

Loesner (1912) describes this variety as having "foliis longius acuminatis integris vel integerrimis a type recedens". Gibson (1970) reduces it to synonymy under typical L. myriocephala Schlecht. & Cham. Tucker describes it as a tree, 4.5 m. tall, the corollas white, with the throat yellow within, and found it growing at 1320—1380 m. altitude, flowering in January. His no. 793 was originally identified and distributed as typical L. myriocephala.

Additional citations: EL SALVADOR: Morazán: Tucker 793 (Ba).

LIPPIA MYRIOCEPHALA var. **OVATIFOLIA** (Moldenke) Moldenke, Phytologia 27: 289. 1973.

Synonymy: Lippia hypoleia var. ovatifolia Moldenke, Phytologia 14: 217. 1967. Lippia bolandieri Schau. ex Moldenke, Phytologia 23: 432, in syn. 1972.

Bibliography: Hocking, Excerpt. Bot. A.12: 424. 1967; Moldenke, Phytologia 14: 217 & 408. 1967; Moldenke, Résumé Suppl. 15: 3. 1967; Moldenke, Biol. Abstr. 49: 1325. 1968; Gibson, Fieldiana Bot. 24 (9): 209. 1970; Moldenke, Fifth Summ. 1: 72 (1971) and 2: 892. 1971; Moldenke, Phytologia 23: 414 & 415 (1972), 27: 289 (1973), and 28: 431—433 & 459. 1974; Moldenke, Biol. Abstr. 58: 684. 1974; Hocking, Excerpt. Bot. A.26: 5. 1975; Moldenke, Phytologia 39: 29. 1978.

Curiously, Gibson (1970) reduces this taxon to synonymy under L. cardiostegia Benth. on page 209 and to typical L. myriocephala Schlecht. & Cham. on page 211 of her work. Hermon & Dwyer encountered this plant in thickets along roadsides in thin soil on limestone substrate.

Additional & emended citations: MEXICO: Chiapas: Roe, Roe, & Mori 1121 (Z—type). GUATEMALA: El Progreso: Hermon & Dwyer 3473 (N). MOUNTED CLIPPINGS: Moldenke, Phytologia 14: 217. 1967 (W).

LIPPIA NANA Schau.

Additional bibliography: Buek, Gen. Soec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 12: 303—304. 1965; Moldenke, Résumé Suppl. 16: 6. 1968; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 893. 1971.

Recent collectors describe this plant as a low herb, 7—10 cm. tall, growing from an xylopodium, with a "thick root", and have encountered it on dry or rocky campos, at altitudes of 975—1075 m., flowering in September and October, fruiting in October. Irwin and his associates found it "in cerrado in region of swampy areas and adjacent cerrado" and "in cerrado in region of gallery forest and adjacent burned-over cerrado". The corollas are said to have been

"yellow on Hatschbach 14776 & 19716 and Irwin & al. 9085 and "yellow, becoming red-orange centrifugally with age" on Irwin & al. 8847.

Material of L. nana has been misidentified and distributed in some herbaria as L. pumila Cham. & Schlecht.

Additional citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 8847 (Z), 9085 (N, N). Paraná: Hatschbach 14776 (W-2564730), 19716 (Ld, N).

LIPPIA NEPETACEA Schau. in A. DC., Prodr. 11: 577-578. 1847.

Bibliography: Schau. in A. DC., Prodr. 11: 577-578. 1847; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 95. 1894; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 32 & 96. 1942; Moldenke, Alph. List Inv. Names 31. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 95. 1946; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 80 & 190. 1949; Moldenke, Résumé 94, 315, & 462. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 95. 1960; Moldenke, Résumé Suppl. 12: 4. 1965; Moldenke, Fifth Summ. 560. 1971; Moldenke, Phytologia 36: 35 & 44. 1977.

This species is based on an unnumbered collection of J. E. Pohl and on Vauthier 410 from Minas Gerais, Brazil, apparently deposited in the Vienna and DeCandolle herbaria.

For some years I have considered this taxon to be conspecific with L. pohliana Schau., but recent examination of type material of both taxa has convinced me that Schauer was correct in maintaining them as separate, albeit closely related, species. In L. pohliana the bracts are wide-spreading and long-acuminate, while in L. nepetacea they are closely appressed and merely acute.

Citations: BRAZIL: Minas Gerais: J. E. Pohl s.n. [in Brasilia] (Mu-69-cotype, Mu-150-cotype, Z-cotype).

LIPPIA NIGERIENSIS Moldenke

Additional bibliography: Meikle in Brenan & al., Kew Bull. 17: 174. 1963; Moldenke, Phytologia 14: 412 & 415. 1967; Moldenke, Fifth Summ. 1: 220, 222, & 241 (1971) and 2: 893. 1971.

LIPPIA OATESII Rolfe

Additional & amended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 278 & 279. 1900; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1051-1052 & 1410. 1962; Moldenke, Phytologia 13: 363. 1966; Wild, Kirkia 7: 25, 34, & 57. 1968; Moldenke, Fifth Summ. 1: 244, 246, & 248 (1971) and 2: 893. 1971.

Recent collectors refer to this plant as up to 3 feet tall, with yellow-green bracts, and have found it growing in serpentine soil on level ground, in flower in November.

Watt & Breyer-Brandwijk (1962) report for this species the vernacular name "nsakafwa" from Zambia and state that in that country the plant is used by natives "as a mosquito repellent by strewing branches on the floor or whisking them about so that the

leaf is damaged. The branches are also kept at the doorway throughout the night". Wild (1968) encountered it in copper-bearing soil at 1100—1500 m. altitude in a region of 500—700 mm. rainfall per year.

Additional citations: RHODESIA: Meebold 18537 (Mu); H. Wild 5621 (Mu, Z).

LIPPIA OAXACANA Robinson & Greenm.

Additional bibliography: Moldenke, *Phytologia* 14: 412. 1967; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 893. 1971; Moldenke, *Phytologia* 38: 398. 1978.

Recent collectors refer to this plant as an aromatic shrub, called "salvia real", and have found it growing at 1300 m. altitude, flowering in August and September, fruiting in August. The corollas are said to have been "yellow" on Barr & al. 62-707 and "cream" on McVaugh 17639. Material has been misidentified and distributed in some herbaria as L. geminata H.B.K.

Additional citations: MEXICO: Guerrero: Halbinger s.n. [Sept. 1968] (M1); Pringle 8417 (Ms—30880, Mu—3913). Jalisco: R. McVaugh 17639 (N). Oaxaca: Pringle 6021 (Ms—30879—isotype, Mu—1800—isotype). Puebla: Barr, Dennis, & Hevly 62-707 (Tu—156845); Herb. J. F. Joor 13 (E—40790); C. Jiménez s.n. [22/VIII/1965] (Ip).

LIPPIA OBOVATA Sessé & Moc.

Additional bibliography: Moldenke, *Phytologia* 12: 308—309. 1965; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 893. 1971; Moldenke, *Phytologia* 38: 394. 1978.

LIPPIA OBSCURA Briq.

Additional & emended bibliography: Briq. in Chod. & Hassl., *Bull. Herb. Boiss.*, ser. 2, 4: [1155]—1156. 1904; Briq. in Chod. & Hassl., *Pl. Hassler.* 2: [491]—492. 1904; Angely, *Fl. Anal. Paran.*, ed. 1, 576. 1965; Moldenke, *Phytologia* 13: 363. 1966; Moldenke, *Fifth Summ.* 1: 156 & 186 (1971) and 2: 541 & 893. 1971; Troncoso, *Darwiniana* 18: 337 & 410. 1974; Moldenke, *Phytologia* 36: 35 (1977) and 39: 173. 1978.

Recent collectors describe this plant as a woody herb or shrub, 0.5—3 m. tall, considerably branched above, the calyx green, and the fruit green, light-green, or gray-green, and have found it growing at 400—1200 m. altitude, flowering from March to June, fruiting in May and June. They have encountered it in sandy clay or reddish soil, on sandy campos with poor vegetation, in sandy soil of dense cerrado, in forests and gallery forest margins and in cerrado along streams, and "in very sandy soil of low grassy cerrado with scattered trees to 5 m. tall". Irwin and his associates refer to it as "frequent in cerrado", Dawson found it "on banks and margins of small streams running through hilly cerrado", while Ratter and his associates encountered it "on edge of raised cerrado-covered mound in grassy campo, not a weed!"

The corollas are said to have been "white" on Anderson 11171, Irwin & al. 17457, Philcox & Freeman 4736, and Ratter & al. R.904, "whitish" on Hatschbach 31869, "cream" on Ratter & al. R.1367, "yellowish-white" on Lindeman & Haas 1456, and "tube yellow, lobes white" on Anderson 9857.

Material of this species has been misidentified and distributed in some herbaria as L. mattogrossensis Moldenke and L. velutina Schau. It is certainly closely related to the former of these, but L. mattogrossensis is easily distinguished by its spreading-hirsute (not antrorsely appressed) pubescence on the branches and twigs.

Additional citations: BRAZIL: Distrito Federal: L. B. Smith 15076 (W—2570040). Goiás: Dawson 14864 (Z). Mato Grosso: W. R. Anderson 9857 (Ld, N); Hatschbach 31869 (Ld, W—2744569); Irwin, Souza, Grear, & Reis dos Santos 16787 (Ac, N), 16799 (Ld, N), 17341 (Ac, N), 17457 (Ld, N); Kirkbride & Lleras 3044 (W—2826920); Philcox & Freeman 4736 (N); Ratter, Bertoldo, Castro, Santos, & Souza R.904 (N); Ratter, Reis dos Santos, Souza, & Ferreira R.1357 (N). Paraná: W. R. Anderson 11171 (Ld, N, W—2753274); Dusén 9219 (Mu); Hatschbach 21587 (Ac); Lindeman & Haas 1456 (Ld); Smith, Klein, & Hatschbach 14604 (N).

LIPPIA ORIGANOIDES H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 216. 1817.

Additional synonymy: Lippia organoides H. Bk. ex T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 469, sphalm. 1904. Lippia oreganoides H.B.K. ex M. Martínez, Pl. Medic. Mex., ed. 1, 429, sphalm. 1933. Lippia origonoides H.B.K. ex Moldenke, Phytologia 31: 403, in syn. 1975.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 216 (1817) and ed. quarto, 2: 267. 1818; Schau., Linnaea 20: 479. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 265 & 266. 1858; Pompa, Collec. Medicament. Indig., ed. 5. 1875; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 469. 1904; Pittier, Man. Pl. Usual. Venez. 314 & 435. 1926; M. Martínez, Pl. Medic. Mex., ed. 1, 429 & 621 (1933) and ed. 2, 430 & 608. 1939; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Hocking, Excerpt. Bot. A.10: 271. 1966; J. A. Steyer., Act. Bot. Venez. 1: 210. 1966; Grieve, Modern Herb. 486. 1967; Moldenke, Phytologia 14: 412. 1967; Moldenke, Résumé Suppl. 15: 4. 1967; M. Martínez, Pl. Medic. Mex., ed. 5, 474 & 639. 1969; Oberwinkler, Pterid. & Sperm. Venez. 15 & 78. 1970; Hartwell, Lloydia 34: 386. 1971; Moldenke, Fifth Summ. 1: 113, 117, 124, 156, & 366 (1971) and 2: 551, 562, 563, & 893. 1971; Farnsworth, Pharmacog. Titles 7 (4): xvii & 222. 1972; Moraes, Correa Mourao, Gottlieb, Silva, Marx, Soares Maia, & Ta-veira Magalhães, Act. Amaz. 2: 45—46. 1972; J. H. B., Biol. Abstr. 57: 2321. 1974; Farnsworth, Pharmacog. Titles 9 (10): v.

1974; Troncoso, Darwiniana 18: 337 & 410. 1974; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [72]. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 61—63. 1975; R. F. Sm., Act. Bot. Venez. 10: 110 & 127. 1975; Moldenke, Phytologia 31: 403 (1975) and 34: 256. 1976; Brieskorn & Poehlmann, Arch. Pharm. Weinheim 309: 829—836. 1976; Anon., Biol. Abstr. 63: 6371 (1977) and 64: 3426. 1977; Moldenke, Phytologia 38: 386, 398, & 405 (1978) and 39: 38, 83, & 87. 1978.

Additional illustrations: R. F. Sm., Act. Bot. Venez. 10: 110. 1975.

The Mexican plant illustrated as L. organoides by Martínez (1933) actually is L. graveolens H.B.K. — the medicinal uses that he reports in detail probably apply to L. graveolens rather than to the South American L. organoides, although the two taxa are very similar and are doubtless very closely related.

The accepted name, L. organoides, is often cited (e.g., Foster, 1958, Moldenke, 1965, López-Palacios, 1975) as having first been published in 1818. However, according to Barnhart (1902) its original publication was in 1817.

Recent collectors describe L. organoides as an erect, unarmed, aromatic shrub or subshrub, 0.5—2.5 m. tall, branched, the bark long-flaky-striate, grayish-brown or "dark-brown over medium-brown", the herbage aromatic, with the odor of orégano, the leaves simple, decussate-opposite, dull pale-green, membranous-brittle, and crenate, the lamina deep-green or medium-yellow-green, rugose, and impressed-venose above, lighter or light yellow-green with prominent venation beneath, the peduncles very light olive-green, the bracts pale-green, covered with whitish hairs, the flowers small, very fragrant, with a slight sweet pungent fragrance of orégano, the calyx very light olive-green. They have found it growing in the subxerophytic zone, on savannas, on semi-deserts, and in poor rocky soil on dry southern slopes, at altitudes of 20—2350 meters, flowering from September to February, as well as in April, June, and July. Rillett refers to it as "frequent in overgrazed desert scrub with cactus, Croton, etc., in sandy soil of rolling hills with granite outcrops".

Romero-Castañeda reports the "hojas estrujadas tienen olor agradable", while Ruiz-Terán & López-Palacios note the "ramitas pardo rojizas". The corollas are said to have been "white" on Alston 6378, López-Palacios 2114 & 2684, Ruiz-Terán & López-Palacios 10287 & 11608, Ruiz-Terán & al. 10800, and Saravia T. & Madriffan 2969, "white with lemon-yellow throat" on Ruiz-Terán & López-Figueiras 1817, "white with yellow-orange throat" on Breteler 3205 and Ruiz-Terán & López-Palacios 6151, "white, yellow in the center" on Davidse & al. 4747, and "cream with yellow throat" on Rillett 737-190.

Vernacular names reported for this species are "chá sem modo", "culanthro cimarron", "culantro cimarron", "orégano", "orégano de burro", and "orégano de cerro".

The Bertero collection cited below is probably part of the type collection of L. berterii Spreng.

Morais and his associates (1972) report thymol as the principal component of the essential oil distilled from the aerial parts of this plant, an oil which also contains paracymene. Grieve (1967) asserts that L. organoides is used as a substitute for Origanum vulgare, while Hartwell (1971) and Pompa (1875) report the use of the leaves in native medicines in Venezuela, mixed with vinegar and salt, in the treatment of "cold tumors". Brieskorn & Poehlmann report the isolation of "(3R,4S)-4-hydroxyl-3-(2'-isopentenyl)-1,2,3,4-tetrahydronaphthalin-1-one (1) and tectol dimethyl ether" from the roots of this species for the first time. They assert that "1 is an isomer of cataponol obtained from...Catalpa ovata".

Peckolt (1904) speaks of Lippia organoides: "Auf den gebirgigen Teilen der Staaten Goyaz, Minas und Rio de Janeiro mit der Benennung Chá sem modo vorkommend. Kleiner eleganter Strauch mit länglichen, stumpfen, oberseits rauhen, unterseits weissfilzigen Blättern und kleinen weissen, orange-gestreiften Blüten. Blätter und wohlriechende Blüten als Getränk bei Rheumatismus sowie als Diaphoretikum". I suspect that the plant here referred to is not L. organoides, but, rather, one of the typically north-Brazilian species of very similar aspect, such as L. elegans Cham., L. glandulosa Schau., L. martiana Schau., or L. velutina Schau.

López-Palacios (1975) has investigated the distribution of L. organoides in Venezuela and reports that "Es éste un arbusto de olor penetrante, de donde su nombre vulgar 'orégano de burro', y aun su adjetivo específico organoides. Sus hojas son muy variables, desde pequeñas y contraídas, como puede observarse en los ejemplares de Mérida y Paraguaná y aun Edo. Bolívar (p.e. López-Palacios 2547, Tamayo 3474, Maguire & Wurdack 35997), que crecen en terrenos soleados y xerofíticos, hasta relativamente anchas y expandidas, como las que se encuentran en zonas sombreadas.

"Lo anterior ha dado origen a que el Dr. Moldenke haya interpretado como L. schomburgkiana la colección Ruiz-Terán & López-Figueiras 1817, pero yo, que he observado en el campo la notoria variación foliar de la especie, puedo asegurar que no se trata, en este caso, de dos especies diferentes.

"Esta sección merece una revisión crítica, y creo que no pocas especies pasarán a ser otra cosa. No me atrevo a asegurar si todos los ejemplares venezolanos de hojas pequeñas deben ser llevados a L. organoides. Es posible que los de Roraima, tales como Irwin 402 y los citados por Knuth, (Initia.....603), puedan sostenerse como L. schomburgkiana.

"¿Podrá considerarse acaso la L. schomburgkiana como una variedad de la L. organoides? No estoy en capacidad de responder la anterior pregunta, pero fuera del olor a orégano en la una, a espliego en la otra (lavender-scented, según Moldenke, Phytolo-

gia 12: 487), no he encontrado diferencia entre los ejemplares determinados como L. schomburgkiana y los de hojas pequeñas de L. origanoides".

Material of L. origanoides has been misidentified and distributed in some herbaria as L. alba (Mill.) N. E. Br., L. graveolens H.B.K., and L. schomburgkiana Schau. On the other hand, the Castañeda 9295, distributed as L. origanoides, actually is L. alba (Mill.) N. E. Br., while Krapovickas, Mroginsky, & Fernández 19169 is L. dumetorum Herzog and P. Clausen s.n. [Aug.-April 1840] and Martius 1037 are L. elegans Cham.

Additional citations: COLOMBIA: Cauca: López-Palacios & Idrobo 3761 (Ld, N). Goajira: Saravia T. & Madriñan 2969 (N, W--2587669). Magdalena: Bertero 2556 (Mu--16); Castañeda 247 (E--1291098); Romero-Castañeda 10465 (N). Nariño: Garganta 538 (W--2771780); Hernández R. 45 (W--2467675); López-Palacios & Idrobo 3781 (Ld, N). Norte de Santander: Garganta 1119 (W--2771836), 1130 (W--2771842). Santander: Langenheim 3087 (Ld); López-Palacios 3612 (Ac, N). VENEZUELA: Bolívar: Davidse, Ramia, & Monteg 4747 (W--2780688); Ruiz-Terán, Carabot, & Morales 10800 (Ld); Ruiz-Terán & López-Palacios 11608 (Ml). Falcón: Ruiz-Terán & López-Palacios 10287 (Ld). Federal District: Debeaux 87 (N). Lará: Alston 6378 (N); A. González 15 (W--2526899); Tamayo 326 (W--1744865). Mérida: Breteler 3205 (W--2465968, Ws); López-Palacios 2114 (Ld), 2547 (Ft); Oberwinkler & Oberwinkler 14148 (Mu); Ruiz-Terán & López-Figueiras 1817 (N); Ruiz-Terán & López-Palacios 6151 (N). Táchira: López-Palacios 2684 (Ld, N); Rillett 737-190 (W--2747326).

LIPPIA OXYCNEMIS Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 13: 363. 1966; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 563 & 893. 1971; Troncoso, Darwiniana 18: 338 & 410. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 50. 1975.

Recent collectors describe this plant as a shrub or subshrub, 0.75--2 m. tall, and have encountered it in cerrado and gallery forests and on wet slopes, at altitudes of 800--1000 m., flowering and fruiting in April, May, and July, in anthesis also in October. They record the vernacular name, "marmiqué".

The corollas are said to have been "lavender" on Irwin & al. 18034, "rose-lavender" on Irwin & al. 15743, "lavender-pink" on Irwin & al. 15085, "rose-pink" on Mexia 5677, and "purple" on Irwin & al. 18201.

The Haenke collection cited below is inscribed as having been collected in Peru, but this seems most improbable as the species is known definitely only from Brazil.

Material of this species has been misidentified and distribu-

ted in some herbaria as Labiatae sp.

Additional citations: BRAZIL: Bahia: Martius s.n. [in campis altis ad C. do Caiteté, Oct.] (Mu—111, Z). Distrito Federal: Irwin, Greear, Souza, & Reis dos Santos 18034 (Ac, N), 18201 (Ld, N); Lima & Barroso 251 (N). Goiás: Irwin, Souza, Greear, & Reis dos Santos 15085 (N), 15743 (Ac, N); J. E. Pohl 137 (Mu—113—cotype). Minas Gerais: Martius s.n. [in campis ad Contendas, Jul.] (Mu—112); Mexia 5677 (Ba). LOCALITY OF COLLECTION UNDETERMINED: Haenke s.n. ["Peruvia"] (Mu—114).

LIPPIA OXYPHYLLARIA (Donn. Sm.) Standl.

Additional synonymy: Lippia oxyphyllaris (Donn. Sm.) Standl., in herb.

Additional bibliography: Moldenke, Phytologia 13: 363. 1966; Gibson, Fieldiana Bot. 24 (9): 209 & 210. 1970; Moldenke, Fifth Summ. 1: 88 & 91 (1971) and 2: 566 & 893. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 67—69, fig. 4. 1973; Molina R., Ceiba 19: 96. 1975; Moldenke, Phytologia 34: 252 (1976), 36: 30 (1977), and 39: 34, 166, 168, & 170. 1978.

Illustrations: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 68, fig. 4. 1973.

Additional and emended characters taken from recently collected material of this species may be summarized as follows: bushy shrub or small tree, 1—6.7 m. tall, with a sage-like odor; stems 2—7.5 cm. in diameter at breast height, obtusely tetragonal to subterete or terete, glabrous; branches and branchlets obtusely tetragonal to terete, more or less densely appressed-pubescent or pilose, much less so in age; leaves with a pungent odor; petioles stout, 5—10 mm. long, densely subappressed-pubescent with cinereous hairs; leaf-blades thick-chartaceous to almost subcoriaceous in age, mostly 1.5—5 cm. long and 1—2 cm. wide during anthesis, later elongating to 12 cm. long and 4 cm. wide, very decidedly bullate and rugose above and very scabrous with many bulbous-based hairs, very densely white-tomentose beneath, mostly acute apically, sometimes somewhat acuminate, regularly serrulate from apex to base with small rounded teeth, long-acuminate basally and prolonged into the petiole; inflorescence shorter than, equaling, or somewhat surpassing the subtending leaves during anthesis, much shorter than the leaves in fruit; peduncles very slender, 1—3 cm. long, densely appressed-pubescent, spreading or somewhat recurved; heads hemispheric, about 2 cm. wide during anthesis, hops-like, oblong and to 4 cm. long and 3.5 cm. wide in fruit, then very hops-like; bracts large, ovate, papyraceous, 1—1.8 cm. long and 5—8 cm. wide during anthesis, reddish, later enlarged and to 1.5 cm. wide, acute apically, short-pubescent or puberulent on the lamina, ciliate-margined. The corollas are said to have been "yellow" on Croat 33076, D'Arcy 10033, Tyson 3632, and Wilbur & al. 11041 & 13337, "pale-yellow" on Wilbur & al. 15309, "yellow or yellowish-white" on Nee 10070, and "either bright- or light-yellow" on Nee 10153.

Recent collectors have found this plant growing on lava flows, in grassy lava fields, on dry grassy flats, in open badly gullied lava fields, along "grazed brushy rocky roadsides", and in pastured ancient lava fields, on old lava flows, in llanos areas on mountainslopes, and in gullies in *Trachypogon-Muhlenbergia* grasslands, at altitudes of 1200—2000 m., flowering from November to May, fruiting in May and December. Wilbur and his associates refer to it as "very common". Molina (1975) records it from Honduras. A wood sample accompanies Stern, Eyde, & Ayensu 1935.

Gibson (1970) asserts that *Molina R. 1456*, *1837*, & *3213*, *Standley 26473*, and *Williams & Molina R. 10802*, previously regarded as *L. lucens* Standl., are *L. oxyphyllaria* instead. She notes that "Although the leaves of *L. oxyphyllaria* are bullate-rugose and sometimes glabrate and lustrous, they are usually more or less pilose; the flower-heads are much larger than those of *L. cardiostegia*, often 2.5 cm. wide, and in fruit 3--4 cm. long, with large bracts, sometimes as long as 1.8 cm."

Material of *L. oxyphyllaria* has been misidentified and distributed in some herbaria as *L. lupulina* Cham. On the other hand, the *Burger & Ramirez B. 4082* and *Williams, Molina R., & Williams 26440*, distributed as *L. oxyphyllaria* in some herbaria, are actually *L. liberiensis* Moldenke.

Additional citations: HONDURAS: Choluteca: *Williams & Molina R. 10802* (G). Morazán: *Molina R. 1456* (G), *3213* (G); *P. C. Standley 26473* (G). COSTA RICA: Puntarenas: *Pittier & Tonduz 10632* (Mu—3778). PANAMA: Chiriquí: *P. H. Allen 1008* (E—1121190), *1541* (E—1190878); *Croat 33076* (N); *D'Arcy 10033* (N); *Davidse & D'Arcy 10387* (N); *Duke 9182* (E—1842647, Oh, W—2617197); *Ebinger 785* (E—1938928); *M. Nee 10070* (Ac); *Stern, Eyde, & Ayensu 1935* [wood spec. USw. 33729] (E—1839582, Mi, W—2490082); *M. Wagner 585* (Mu—56, Z); *Peggy White 332* (E—1191388); *Wilbur, Almeda, Luteyn, & Utley 15309* (Mi, N, W—2695695); *Wilbur, Luteyn, & Armand 11868* (Mi, N); *Wilbur & Teeri 13337* (Mi, N); *Wilbur, Weaver, Foster, & Correa 11041* (Mi, N). Veraguas: *M. Nee 10153* (Ac); *Tyson 3632* (E—1870018).

LIPPIA PALMERI S. Wats.

Additional synonymy: *Lippia (Zapania) palmeri* S. Wats., Proc. Am. Acad. 24: 67. 1889.

Additional bibliography: Rose, Contrib. U. S. Nat. Herb. 1: 75. 1890; T. S. Brandeg., Proc. Calif. Acad. Sci., ser. 2, 3: 163. 1893; E. W. Nels., Mem. Nat. Acad. Sci. 1 (16), imp. 1 & 2, 123. 1923; Moldenke, Phytologia 14: 412—413. 1967; Moldenke, Résumé Suppl. 15: 3 (1967) and 17: [1] & 2. 1968; Moldenke, Fifth Summ. 1: 72, 77, & 78 (1971) and 2: 556, 563, & 893. 1971; Altschul, Drugs & Foods 244. 1973; Felger & Moser, Econ. Bot. 28: 429. 1974; Folger & Lowe, Nat. Hist. Mus. Los Angeles Co. Contrib. Sci. 285: 50. 1976.

The original description of this species by Watson (1889) is "Near L. graveolens; shrubby, 3 to 5 feet high; leaves ovate to elliptical, the blade decurrent upon the short petiole, obtuse or acutish, rugose, subcrenately toothed, finely substrigose-pubescent, an inch long or often much less: peduncles solitary or in pairs in the axils, very short; heads often few-flowered, 2 to 6 lines long; bracts decussate, the lower united to the middle, the upper distinct: calyx thin, not carinate; corolla salverform. — 'Origano', with a strong sage-like odor and used as a potherb. In arroyos about Guaymas. Flowers white or cream-color (277, 644), or rose-color (643)."

Goldman (1918) reports that it is "Not uncommon in rocky places among the hills 20 miles east of San Ignacio, where it was taken in flower October 19. It was also collected in flower along the road from Agua Colorada to Cerro Colorado northwest of La Paz, December 15. Brandegee records it from Miraflores in the Cape District south of La Paz. Lippia palmeri was described from specimens taken at Guaymas and therefore includes in its range subtropical areas on both sides of the Gulf of California. It is a small bush 0.5 to 1.8 meters high." Johnston (1924) reports it "a frequent plant about Willards Point (4267) and along the southeast shore on Tiburon Island. It is a characteristic shrub on rocky benches and on the drier, lower slopes of the hills, and forms a rounded bushy mass of many slender twiggy stems 6—10 dm. high. The collected specimens seem to have slightly smaller, less rugose, and less crenate leaves than do the other available collections of this species."

Standley (1924) reports the name, "orégano", from Sonora and asserts that the plant is used there for flavoring meat. Felger & Moser (1974) list "oregano" and "xonka?iift" and vernacular names and say that the plant is used to kill head lice. Altschul (1973) claims that the odorous herbage is used as a condiment.

Recent collectors describe this plant as a small, open, straggly, slender shrub, 1—2 m. tall, the herbage highly odorous, and the flowers small, in stout spikes, with a strong chili-like taste, and have found it growing on basalt hills, on basaltic hill slopes, rocky hillsides, in sandy soil and sandy desert "badajadas", along small arroyos, and in dry washes. Wiggins found it "on rocky mounds behind the inner dunes", Stevens reports it "occasional on rocky hills", and Carter & Moran found it "on steep north-facing slopes with Mimosa purpurascens, Bursera microphylla, and Jatropha cinerea". Hastings & Turner encountered it in "sandy soil on level terrain with Cyrtocarpa edulis, Bursera microphylla, B. odorata, and Jatropha cinerea" and "in small wash with Prosopis, Olneya, and Fraseria". Carter & Ferris found it on "north-facing slopes with Lysiloma candida, Mimosa purpurascens, Jatropha cinerea, Sapium biloculare, Jacquemontia, and Ruellia". Moran reports it "occasional in rocky arroyos", "only one seen", "seen in only one place", "a few at south base of rocky slope", and "in wash near mouth of arroyo, also seen on mesa". [to be continued]

NEW COMBINATIONS IN DICHANTHELIUM (POACEAE)

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Hitchcock and Chase (1910) created the subgenus Dichanthe-
lium for a distinctive group of New World species of Panicum. The members of the subgenus were characterized as being caudex-forming perennials which die back to a rosette of short, broad leaves in winter. In spring the main culms bear terminal panicles of chasmogamous spikelets which according to Hitchcock and Chase, and Church (1927) were mostly infertile. In summer profuse branching and rebranching from main culm nodes often produces fascicles of reduced branches and numerous small panicles of cleistogamous spikelets which usually produce seeds.

A few other distinctive features of the subgenus Dichanthe-
lium were observed in subsequent years. Brown (1948), Bowden (1960), and others noted that most of the species are diploids ($n = 9$) in contrast to the high frequency of polyploidy in other groups of Panicum. Lelong (1965), Freckmann (1967), and Spellenberg (1975) indicated that most of the taxonomic problems in the large species complexes seem to be attributable to a combination of hybridization and autogamy rather than apomixis. It was also noted that the species of Dichantherium are more abundant in warm temperate areas, especially on the Coastal Plain, and were more active in the cooler seasons, especially the spring, generally beginning blooming two months earlier than species of other subgenera of Panicum.

More recent observations have strengthened the case for giving generic status to Dichantherium. Brown (1958) noted that one species of Dichantherium lacked the Kranz anatomy which occurs in most panicoid grasses. Hsu (1965) found that species of the subgenus Dichantherium, including species of the section Turfosa which he transferred to the subgenus, had a unique combination of features of the lemmatal epidermis, the style branches, the lodicules, and the ligules. Smith and Brown (1973), Bender and Smith (1973), and Brown and Smith (1975) examined more than half of the species of Dichantherium and found that all lacked Kranz anatomy and all had C-3 photosynthetic pathways rather than the C-4 pathway prevalent in panicoid grasses. Gould (1974) elevated Dichantherium to generic status. Clark and Gould (1975) provided further evidence for its status as a genus through a comparative study of palea epidermis of Dichantherium, Panicum, and Echinochloa.

Gould (1974) and Spellenberg (1975) provided new combinations for species occurring in Texas and the western U.S. I am completing a study of Dichanthelium in Wisconsin to be submitted for publication in the Transactions of the Wisconsin Academy of Sciences, Arts, and Letters. Although this study is based on all Wisconsin specimens at WIS, MIL, UWM, UWSP, UWO, UWIC, and MIN, specimens throughout the geographic range of the species treated, including type material, have been examined at US, MO, and ISC. Several new combinations are required. A more complete discussion of the evidence in support of the taxonomic decisions leading to these new combinations will be presented in the paper to be submitted to the Wisconsin Academy.

Dichanthelium perlongum (Nash) Freckmann, comb. nov.

Bas.: Panicum perlongum Nash, Bul. Torrey Bot. Club 26: 575. 1899.

Freckmann (1967), Voss (1972), and others have noted intergradation between Panicum depauperatum, P. linearifolium, and P. perlongum. Gould (1975) maintained the first two as separate species in Dichanthelium, but placed P. perlongum in synonymy under D. linearifolium. Only 25 specimens out of 395 specimens from Wisconsin appear to me to be intermediate between any pair of these three species. Only two of these specimens are intermediate between D. perlongum and D. linearifolium. These intermediate specimens have a pollen fertility of 47-49% (determined by shape and stainability in lactophenol - cottonblue) compared to 91-97% for typical D. linearifolium and 87-97% for typical D. perlongum. In Wisconsin D. perlongum produces chasmogamous spikelets about one week earlier than D. linearifolium when the two grow together, and appears to be primarily autogamous when the latter species begins its chasmogamous phase.

Dichanthelium wilcoxianum (Vasey) Freckmann, comb. nov.

Bas.: Panicum wilcoxianum Vasey, U. S. Dept. Agr., Div. Bot. Bul. 8: 32. 1889.

Circumstantial evidence and comparative morphology suggest that D. wilcoxianum is a derivative of hybridization between D. perlongum and D. villosissimum var. praecocius (Lelong, 1965; Freckmann, 1966). However, it is usually fertile with good seed set yielding essentially uniform progeny.

Dichanthelium boreale (Nash) Freckmann, comb. nov.

Bas.: Panicum boreale Nash, Bul. Torrey Bot. Club 22: 421. 1895.

This is a fairly well-marked species of the northern U.S. which rarely intergrades with D. lanuginosum var. lindheimeri.

Dichanthelium lanuginosum (Ell.) Gould var. lindheimeri (Nash) Freckmann, comb. nov.

Bas.: Panicum lanuginosum var. lindheimeri (Nash) Fernald, Rhodora 36: 77. 1934. P. lindheimeri Nash, Bul. Torrey Bot. Club 24: 196. 1897.

This taxon is in need of further study. It may encompass two or three elements including delicate, slender plants of wet meadows, fens, and shores; glabrous extremes of D. lanuginosum var. fasciculatum (Torr.) Spellenb.; and derivatives of hybridization between D. lanuginosum and either D. dichotomum (L.) Gould or D. boreale.

Dichanthelium villosissimum (Nash) Freckmann, comb. nov.

Bas.: Panicum villosissimum Nash, Bul. Torrey Bot. Club 23: 149. 1896.

Synonyms include D. lanuginosum var. villosissimum (Nash) Gould.

This is a species of the southern U.S., most common in dry, sandy, open woodlands.

Dichanthelium villosissimum (Nash) Freckmann var. praecocius (Hitchcock and Chase) Freckmann, comb. nov.

Bas.: Panicum lanuginosum Ell. var. praecocius (Hitchcock and Chase) Dore in MacNeil and Dore, Le Naturaliste Can. 103: 562. 1976. P. praecocius Hitchcock and Chase, Rhodora 8: 206. 1906.

Although some intergradation occurs between all pairs of taxa within the "lanuginosum" complex, it seems to me that intergradation between var. praecocius - a tall grass prairie taxon of the upper Midwest - and var. villosissimum - a taxon of southern dry woodlands - is more frequent and significant than the intergradation between either variety and the local variety of D. lanuginosum.

Dichanthelium columbianum (Scribner) Freckmann, comb. nov.

Bas.: Panicum columbianum Scribner, U.S. Dept. Agr., Div. Agrost. Bul. 7: 78, f. 60. 1897.

Synonyms include Panicum tsugetorum Nash.

In the upper Midwest this species intergrades fairly frequently with D. meridionale and rarely with D. commonsianum var. euchlamydeum.

Dichanthelium meridionale (Ashe) Freckmann, comb. nov.

Bas.: Panicum meridionale Ashe, Jour. Elisha Mitchel Sci. Soc. 15: 59. 1898.

Synonyms include Panicum albemarlense Ashe.

Many intermediate specimens, apparently including putative F_1 hybrids, backcrosses, and autogamous races, link this species with D. lanuginosum and D. columbianum. Nevertheless, the majority of specimens are highly fertile and occupy distinct habitats or niches.

Dichanthelium commonsianum (Ashe) Freckmann, comb. nov.
Bas.: Panicum commonsianum Ashe, Jour. Elisha Mitchell Sci. Soc. 15: 55. 1898.

This is a fairly distinctive Coastal Plain species usually found on very sandy soils in open areas.

Dichanthelium commonsianum (Ashe) Freckmann var. euchlamydeum (Shinners) Freckmann, comb. nov.
Bas.: Panicum commonsianum Ashe var. euchlamydeum (Shinners) Pohl, Amer. Midl. Nat. 38: 507. 1947. P. euchlamydeum Shinners, Amer. Midl. Nat. 32: 170. 1944.

Pohl (1947) suggested that this variety represented an inland extension of P. commonsianum which moved into the upper Midwest during the recession of Pleistocene glaciers. The two taxa intergrade in Pennsylvania. Intergradation between both varieties and D. columbianum occurs to a lesser extent from Michigan eastward.

Dichanthelium leibergii (Vasey) Freckmann, comb. nov.
Bas.: Panicum leibergii (Vasey) Scribner, in Britt. and Brown, Illustr. Fl. 3: 497. 1898. P. scoparium var. leibergii Vasey, U.S. Dept. Agr., Div. Bot. Bul. 8: 32. 1889.

This is a characteristic species of the tall grass prairie region. It is a diploid (Brown, 1948) closely related to D. xanthophysum. Rarely it forms essentially sterile hybrids with other species of Dichanthelium.

Dichanthelium xanthophysum (Gray) Freckmann, comb. nov.
Bas.: Panicum xanthophysum Gray, Gram. et Cyp. 1: No. 28. 1834.

This species is closely related to D. leibergii, but is a tetraploid (Bowden, 1960). Its range generally lies north of D. leibergii. It apparently occasionally produces sterile hybrids with certain diploid species including D. leibergii.

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SUPPLEMENTARY NOTES ON THE AMERICAN SPECIES

OF STRYCHNOS. XVI.

B. A. Krukoff

Consulting Botanist of Merck Sharp & Dohme Research Laboratories, Rahway, N. J., and Honorary Curator of New York Botanical Garden.

Since the latest paper of this series (Supplement XV) was published, 59 new collections were examined. Substantial progress is being made in exploring Northern Venezuela as well as Amazonian Brazil and Peru.

The newly examined collections added to our knowledge of several species, extension of range were noted for six and one species, namely Strychnos ecuadoriensis Krukoff & Barneby, was described as new.

Of particular interest are collections from Northern Venezuela (Sucre & Lara) where time and again we find species previously known from the basin of the Amazon. Strychnos toxifera, as in the past, was found in most unexpected localities, that is in Antioquia, Colombia as well as near Manaus, which locality was well collected previously. (See Supplement XV.)

1. Strychnos chlorantha Progel in Mart. Fl. Bras. 6(1):273. 1868.

Guatemala: Alta Verapaz: Sacte, Irene Kunkel s.n. (16/5-1976) (EAP).
Local name: Ixbam.

8. Strychnos barnhartiana Krukoff, Brittonia 4:268. 1942.

Brazil: Amapa: B. G. S. Ribeiro 1799 (IAN).

9. Strychnos araguaensis Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(1):24. 1969.

Brazil: Para: Serra do Cachimbo, Prance 25203 (northern foothills), 25307 (alt. +350 m).

Both collections are from terra firme.

12. Strychnos panamensis Seemann, Bot. Voy. Herald 166. 1854.

Honduras: Yoro': 3 kms NW of Santa Rita, W. E. Harmon 3884 (MO). Panama: Darién: Cerro Tacarcuna, alt. 1400-1600 m, Al.

Gentry 16871 (MO). Venezuela: Zulia: Santa Barbara, Santiago López-Palacios 1897 (MERF). Colombia: Chocó: Al. Gentry 17176 (MO).

This is the first record of the species from Honduras.

13. Strychnos tabascana Sprague & Sandwith, Kew Bull. 1927: 128. 1927.

Mexico: Veracruz: Catemaco, silva alta primaria, R. Hernandez M. 1375 (F), J. H. Beaman 5153 (F). Belize: T. Arnason 17062 (MO).

15. Strychnos bahiensis Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(1):29. 1969.

The holotype of this species deposited in NY is correctly labeled as R. P. Belem 1818, whereas that of S. atlantica as R. P. Belem & R. S. Pinheiro 3228. They are also correctly cited in the original descriptions.

Two typographical errors were made, however, one in Supplement XI, Phytologia 22:236. 1971 where Belem & Pinheiro 3228 is cited as S. bahiensis, which error was perpetuated in Index of Exsiccatae, (Lloydia 35:262. 1972). It is also likely that "Belem 8228" cited in the same Index as S. atlantica does not exist and it is a typographic error for "3228". This specimen is not in the NY Herbarium and is not cited in any of my papers.

18. Strychnos medeola Sagot ex Progel in Martius, Fl. Bras. 6 (1):282. 1868.

Brazil: Para: Serra do Cachimbo, Tukurui, Transamazonica, km 115-120, A. S. Silva 169.

19. Strychnos toxifera Robert Schomburgk ex Benthams, Jour. Bot. Hook. 3:240. 1841.

Colombia: Chocó: near sea level, Al. Gentry 17171 (MO); Antioquia: alt. 400-900 m, D. Soejarto 3934 (MO).

This is the first record of this species from Antioquia.

20. Strychnos tomentosa Benthams, Jour. Linn. Soc. 1:104. 1856.

Venezuela: Sucre: Rio Grande, Victor Carreño Espinosa s.n. (30/6-1973) (VEN); Lara: Terepaimo, R. F. Smith 7415 (VEN).

These are new records of the species from Sucre and Lara.

25. Strychnos pseudo-quina A. St. Hilaire, Mem. Mus. Paris 9:340. 1822.

Brazil: Goias: Luziana, G. Hatschbach 36385.

31. Strychnos peckii B. L. Robinson, Proc. Amer. Acad. 49:504. 1913.

French Guiana: Saul: Fr. Halle 98, 2274. Peru: Loreto: Maynas, Juan Revilla 751 (MO).

32. Strychnos erichsonii Richard Schomburgk, Reisen 3:1082. 1848. Nomen; ex Progel in Mart. Fl. Bras. 6(1):274. 1868.

Brazil: Para: Serra do Cachimbo, Cuiaba-Santarem highway, km 1339, Rio Ariri, Prance 25714. Peru: Loreto: Al Gentry 16665 (Rio Mazán), Juan Revilla 1158 (MO).

- 32a. Strychnos croatii Krukoff & Barneby in Phytologia 33:313. 1976.

Panama: Colon: alt. 50-200 m, T. B. Croat 37023 (MO); Panama: Croat 34790 (MO) (alt. 350-375 m), M. D. Correa 1660 (MO) (alt. 300-400 m); San Blas: Duke 14733A (MO). Colombia: Chocó: alt. +100m, Al Gentry 17822 (MO).

This is the first record of the species from San Blas.

35. Strychnos bredemeyeri (Schultes) Sprague & Sandwith, Kew Bull. 1927:128. 1927.

Venezuela: Sucre: alt. +280 m, Steyermark 108470 (VEN); Terr. Fed. Amazonas, alt. +100 m, G. Morillo 4134-A (VEN).

This is the first record of the species from Sucre.

- 36a. Strychnos mitscherlichii Richard Schomburgk, Reisen 2:451. 1848, var. mitscherlichii.

Brazil: Amazonas: J. M. de Albuquerque 43 (INPA) (Manaus), C. D. Mota 146 (INPA) (Porto Velho), Prance 23956 (INPA) (Rio Javari); Rondonia: M. R. Cordeiro 777. Peru: Loreto: Maynas, Juan Revilla 981 (MO).

38. Strychnos darrieniensis Seemann, Bot. Voy. Herald 166. 1854.

Peru: Loreto: Al. Gentry 18416 (Rio Itaya, varzea), 16681 (Rio Nanay, between Iquitos and Puerto Almendra, alt. ± 120 m).

38a. Strychnos ecuadoriensis Krukoff & Barneby sp. nov.

Sect. Strychno pertinens, inter quos inflorescentiis axillaribus simul ac calycis lobis lineari-lanceolatis, corollae tubo intus glabro, styloque glaberrimo praestat.

Macroscopic: petioles 1-4 mm long, blades narrowly elliptic, 5.5-12 cm long, 2.5-5 cm broad, narrowed at base, acuminate at apex, dull on both surfaces, membranaceous to chartaceous, 3-plinerved with the inner pair alternate, and diverging at 1-1.5 cm from base, reticulation obscure or faint above, prominent below. Microscopic: petioles and blades are essentially glabrous in all parts; leaf-blades not verrucular above or beneath, not barbate and without a membranaceous pocket beneath in axils of the inner principal nerves.

Inflorescences axillary, the glabrous peduncle is very short, ± 1 cm; calyx-lobes linear-lanceolate (calyx ± 0.8 mm and lobes ± 1 mm), glabrous; corolla-tube ± 2.1 mm (immature), and lobes ± 1.3 mm, glabrous inside and outside; anthers sessile, ± 0.8 mm; style glabrous, ± 2.5 mm long.

Fruits not seen.

Ecuador: Napo; 4.2-7.5 km W. of Lago Agrio (5-8.2 km E of Rio Conejo) near Lago Agrio-Baeza road; rainforest, alt., ca 340 m, B. MacBryde & J. D. Dwyer 1363 (MO-holotype, NY-fragment of holotype).

Shrub 2 m high with cream flowers, collected on March 31, 1972 and devoid of tendrils or spines.

The following combination of characters distinguishes S. ecuadoriensis from all known species of section Strychnos: inflorescences axillary, style glabrous, calyx-lobes linear-lanceolate and corolla-tube glabrous inside. The sterile specimens are distinguished by the following characters: leaf-blades are essentially glabrous above and beneath, dull, membranaceous to chartaceous, not verrucular above or below, not barbate and without a membranaceous pocket beneath in axils of the inner principal nerves, essentially 3-plinerved.

This species is very distinct not only in Sect. Strychnos but from all members of the other two sections. We are placing it at the end of the Sect. Strychnos.

Strychnos ecuadoriensis Krukoff & Barneby

- 1. Leaf + axillary inflorescence
- 2. Flower before anthesis
- 3. Pistil
- 4. Flower bud opened to show anthers



The holotype is from the small shrub ± 2 m high without spines or tendrils, growing on the low elevation in the rain forest. It is probably a vine at maturity and posses tendrils. It's fruits probably are of small size with thin shells. In the section Strychnos only S. medeola is a weak vine confined to the understory of the rain forest. Of the thirty nine spp. of Sect. Strychnos only eleven spp. have glabrous style and none of these have calyx-lobes linear lanceolate.

In the Sect. Breviflorae only the very distinct S. parviflora has axillary inflorescences. In the Sect. Rouhamon six species have style and ovary glabrous and they are distinguished at a glance from S. ecuadoriensis.

39. Strychnos guianensis (Aublet) Martius, Syst. Mart. Med. Bras. 121. 1843.

Venezuela: Terr. Fed. Amazonas: Rio Guayapo, alt. \pm 150 m, Gilberto Morillo 3450 (VEN). Brazil: Para: Ilha de Marajo, P. Lacerda 75 (IAN); Amazonas: Prance 17850 (INPA) (Rio Cuieras), F. Mello s.n. (23/04-1976) (INPA) (munic. Coari), N. T. Silva 4188 (IAN) (Rio Jandiatuba), S. A. Mori 9206 (upper Solimoes, near Colombian border); Acre: Cruzeiro do Sul, O. F. Monteiro 596 (INPA); Rondonia: Igarape Preto, B. G. S. Ribeiro 1079 (MG). Peru: Loreto: Maynas, J. Revilla 405 (MO) Al. Gentry 18343 (MO) (mouth of Rio Javari).

42. Strychnos bicolor Progel, Vidensk. Meddel. 1869:31. 1869.

As late as in 1972 (Lloydia 35:235. 1972) S. bicolor was separated from closely related S. guianensis by leaf-blades beneath densely fulvons-velutinous, above grey-glaucous and with conspicuous fulvous line on midrib.

Their ranges were thought to be distinct, S. bicolor occurring in Minas Gerais, the Federal District, Mato Grosso and São Paulo in central Brazil, whereas S. guianensis was known to be well distributed in the basin of the middle and upper Rio Orinoco and throughout the entire Amazon basin.

Abundant recent collections from Goias, the Federal District and Minas Gerais indicate that the concept of S. bicolor has to be changed. Some of the specimens are almost glabrous beneath but still grey-glaucous above, others almost glabrous beneath and even not grey-glaucous above. Eventually S. bicolor likely will have to be reduced to the synonymy of S. guianensis or retained as a form with a much restricted range in the State of São Paulo and adjacent regions. I am unable to do this even though, as per my card-

files, 25 collections of S. bicolor were seen by me, only a few are deposited in NY. Furthermore, field work is needed before this problem can be satisfactorily resolved.

43. Strychnos panurensis Sprague & Sandwith, Kew Bull. 1927:132. 1927.

Venezuela: Bolivar: Francisco Delascio Chitti 2790
(VEN). Colombia: Chocó: Al. Gentry 17797.

This species is not found in Minas Gerais (see under "Changes in the Identifications" in this paper).

54. Strychnos atlantica Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(1):61. 1969.

For two typographical errors in Suppl. XI and Index of Exsiccatae, see under S. bahiensis.

55. Strychnos rubiginosa A.DC., Prodr. 9:16. 1845.

Brazil: Bahia: Remanso, margem BR-235, Dardano de A. Lima s.n. (18/8-1973).

65. Strychnos mattogrossensis S. Moore, Trans. Linn. Soc. II. 4:392. 1895.

Peru: Loreto: Requena, Juan Revilla 707.

69. Strychnos poeppigii Progel in Mart. Fl. Bras. 6(1):282. 1868.

Peru: Loreto: Maynas, S. McDaniel 15267 (MO), 16163 (MO).

70. Strychnos tarapotensis Sprague & Sandwith, Kew Bull. 1927:131. 1927.

Peru: Loreto: Maynas, Juan Revilla 574 (MO), 575 (MO), 611 (MO), 815 (MO), Al. Gentry 18348 (MO); Huánuco: T. Plowman 5770 (F).

ERRORS IN SUPPLEMENT XV (Phytologia 26: June 1971)

page 18, under S. rondeletiodes - Paul E. Berry 638 should read 658.

page 18, under S. brachiata - J. Schunke 2310 should read 8310.
page 21, under S. guianensis, Mori & Prance 2206 should read 9206.

page 22, under S. tarapotensis - T. Plowman & H. Kennedy 3812
should read 5812.

Changes in the identifications

| | Cited originally as | Cited later as |
|---------------------------------|---|----------------------------|
| <hr/> | | |
| G. Hatschbach 30032 | panurensis Suppl. XIV, p. 316 | gardneri Suppl. XVI |
| J. C. Lindeman 234 | mitscherlichii var. mitscher- lichii Suppl. XV, p.20 | cogens Suppl. XVI |
| J. C. Lindeman 734 | mitscherlichii var. mitscher- lichii Suppl. XV, p.20 | cogens Suppl. XVI |
| G. T. Prance 22506 | rondeletiioides Suppl. XIV, p. 308 | xinguensis Suppl. XVI |
| G. T. Prance 23126 (sterile) | hirsuta Suppl. XIV, p. 316 | sandwithiana Suppl. XVI |

Bibliography

(In order to conserve space, I am citing here only the papers which are not cited in Suppl. VII-XV.)

72. Krukoff, B. A. Supplementary notes on the American species of *Strychnos*. XV. *Phytologia* 36:17-22. 1977.

List of Exsiccatae

The first list of Exsiccatae covering my papers on *Strychnos*, including Supplement XI, was published in *Lloydia* 35(3): 262-270. 1972. The second list of Exsiccatae covering Supplements XII, XIII and XIV was published in *Phytologia* 33:319-322. 1976. The present list of Exsiccatae covers Supplements XV and XVI. The number in parenthesis corresponds with the species - number of this and other papers (Supplements XII to XV). Only numbered collections and those of which the dates of collection are recorded have been listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's number are cited under Prance.

Albuquerque, J. M. de, 43 (36a).

Arnason, T., 17062 (13).

Beaman, J. H., 5153 (13).

Berry, Paul E., 658 (6), 1405 (24), 1447 (24), 1544 (21), 1607 (35).

Breedlove, D. E., 30708 (12), 33158 (13), 38882 (13).

Chitti, Francisco Deslascio, 2790 (43), 3146 (12).

Cordeiro, M. R., 777 (36a).

Correa, M. D., 1660 (32a).

Croat, T. B., 10097 (12), 12403 (69), 21935A (12), 24961 (63), 34790 (32a), 37023 (32a), Transect 114 (32a).

Duke, J. A., 13331 (43), 14733A (32a), 15800 (43).

Espinosa, Victor C., s.n. (30/6-1973) (20).

Gentry, A1., 9430 (12), 15196 (19), 16665 (32), 16675 (39), 16677 (6), 16681 (38), 16871 (12), 17171 (19), 17176 (12), 17797 (43), 17822 (32a), 18343 (39), 18348 (70), s.n. (Jan. 1976) (6).

Goodland, R., 461 (19).

Halle, Fr., 98 (31), 2274 (31).

Handro, Oswaldo, 439 (25).

Harmon, W. E., 3884 (12).

Hatschbach, G., 33409 (11), 34010 (25), 35135 (59), 35591 (64), 35625 (59), 36072 (25), 36385 (25).

Herbarium Jard. Botan. Rio, 55680 (59), 109209 (11), 114491 (11), 114845 (56), 130177 (25), 141312 (59), 141313 (59).

Hernandez, M. R., 1375 (13).

Kunkel, Irene, s.n. (16/5-1976) (1).

Lacerda, P., 75 (39).

Lima, Dardano de, s.n. (18/8-1976) (55).

Lindeman, J. C., 234 (47), 522 (32), 734 (47).

López-Palacios, Santiago, 1897 (12).

MacBryde, B., 1363 (38a).

McDaniel, S., 15267 (69), 16163 (69).

Mello Filho, Luiz Emygdio de, s.n. (23/04-1976) (39).

Monteiro, O. F., 596 (39).

Mori, S., 8493 (48), 9036 (39), 9121 (32), 9126 (32), 9206 (39).

Morillo, Gilberto, 3450 (39), 4134-A (35).

Mota, C. D., 146 (36a).

Ortiga, Alberto T., 401 (31).

Plowman, T., 5067 (70), 5770 (70), 5812 (70).

Prance, G. T., 17850 (39), 21206 (6), 21207 (6), 21254 (28),
21502 (35), 22506 (26), 22884 (28), 23126 (23), 23403
(6), 23438 (47), 23445 (36a), 23569 (19), 23956 (36a),
24426 (36a), 24541 (32), 24699 (32), 25203 (9), 25307
(9), 25714 (32).

Revilla, Juan, 172 (39), 174 (6), 405 (39), 574 (70), 575 (70),
611 (70), 707 (65), 751 (31), 815 (70), 981 (36a),
1158 (32).

Ribeiro, B. G. S., 1079 (39), 1799 (8).

Rodrigues, W., 9519 (24).

Sastre, C., 766 (10), 4024 (32).

Schunke, V., José, 39 (31), 40 (36a), 42 (31), 43 (23), 44 (43),
56 (23), 8144 (37), 8150 (70), 8310 (10).

Silva, A. C., 169 (18).

Silva, Nilo T., 3352 (18), 4188 (39).

Smith, R. F., 7415 (20).

Søejarto, D. D., 3934 (19).

Steyermark, J. A., 108470 (35).

SUPPLEMENTARY NOTES ON AMERICAN MENISPERMACEAE XIII
NEOTROPICAL TRICLISTIEAE AND ANOMOSPERMEAE

B. A. Krukoff ⁽¹⁾ and R. C. Barneby ⁽²⁾

Since the latest paper of this series (Supplement XII) was published, 102 new collections were examined. An excellent progress is being made in exploring French Guiana, also Peru, Northern Venezuela and Brazil.

The newly examined collections added to our knowledge of several species, extension of range were noted for nine, and one species, namely, Sciadotenia peruviana Krukoff & Barneby was described as new.

It was particularly pleasing to place Abuta splendida Krukoff & Moldenke in synonymy under the historical Abuta rufescens Aublet. We have been waiting since 1970 for new material which might enable us to resolve this problem.

II. Curarea Barneby & Krukoff, Mem. N. Y. Bot.

Gard. 22(2): 7. 1971.

1. Curarea toxicofera (Weddell) Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 9. 1971.

Peru: Loreto: Al. Gentry 18505 (MO) (Rio Itaya, +40 km above Iquitos); Juan Revilla 445 (MO) (Iquitos, Rio Momoh).

2. Curarea candicans (L. C. Richard) Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 12. 1971.

Surinam: Kayser Mountains, S. Mori 8620. French Guiana: Saul: de Granville 2649 (CAY), 2709 (CAY).

3. Curarea tecunarium Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 12. 1971.

Peru: Loreto: Rio Corrientes at the Ecuadorian border, Al Gentry 19006 (MO).

III. Sciadotenia Miers, Ann. Nat.

Hist. II. 7: 43. 1851

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(2) Research Associate, The New York Botanical Garden.

1. Sciadotenia cayennensis Benth. Jour. Linn. Soc. Bot. 5 (Suppl. 2): 51. 1861.

French Guiana: C. Moretti 454 (CAY) (Saul), 808 (CAY) (Litani), 843 (CAY), de Granville 5189 (CAY) (Saul), Fr. Halle 2225 (Saul), Cremers 1415 (CAY) (Trois Sauts), S. Mori 8771 (Mont Galbao, summit cloud forest), 8803 (vicin. of Montagne Belvedere).

2. Sciadotenia toxifera Krukoff & A. C. Smith, Bull. Torrey Club 66: 308. 1939.

Peru: San Martin: Mariscal Cáceres, Tocache Nuevo, José Schunke V. 9835 (Nov. 4, 1977), 9836 (Nov. 6, 1977). Both vines are 20-30 m long.

These are vouchers for samples of stemwood used by Dr. Cava in connection with his chemical studies for Cancer Institute.

6. Sciadotenia eichleriana Moldenke in Krukoff & Moldenke, Brittonia 3: 28. 1938.

French Guiana: Saul: de Granville 2729 (CAY).

- 6a. Sciadotenia (§ Sychnosepalum) peruviana Krukoff & Barneby, sp. nov. juxta affinem S. eichlerianam Moldenke, ab ea foliorum lamina supra praeter venas primarias laevi, venulis scalariformibus reticulique impressis immersisve primo intuitu diversa.

Peru: Amazonas: Quebrada de Basu^vsinuk, tributary of Huampami, 270 m (900 ft) alt., 16.IX.1972 (O fr), Rubio Kayap 97. -- Holotypus, N.Y.

Vines of unknown size, the branches of the year finely canaliculate, non-lenticellate, densely subretorsely pilosulous with stiff hairs ± 0.2 mm, glabrescent. Petiole 3--8 cm, near middle ± 1.5 mm diam, dilated both ends; blades ovate-cordate-acuminate 14--18 X 7.5--12 cm, when dry brownish-olivaceous, above smooth, dull, beneath densely pilosulous with erect grayish hairs (not tomentose), palmately 5-plinerved from petiole, the outer pair of primary veins short, weak, incurved $1/4$ -- $1/5$ the length of blade subparallel to its cordate basal curve, the inner pair incurved-ascending $\pm 2/3$ the length of blade, the midrib giving rise on each side, well above middle, to 1--2 major incurved secondaries, these all above faintly, beneath very sharply and coarsely prominulous, the connecting scalariform and minor venules above impressed or fully immersed, beneath prominulous,

the ultimate reticulation of well-defined areoles mostly > 1 mm diam. Inflorescence ♂ unknown, ♀ either axillary subspicately 1--3-flowered or similar but borne on very short, supra-axillary leafless branchlets, 1--3 cm long, the primary axis, subobsolete pedicels, perianth, and gynophores of the fruit all densely fuscous-pilosulous; sepals (seen in bud only) 12; carpels 6. Gynophores in fruit +18 mm, united +8 mm into a column, the free arms dilated and 3-angulate distally; drupe compressed-obovoid, 15--18 X 9--10 mm, the tawny-venutinous exocarp and (dry) scarcely fleshy mesocarp together +0.1 mm thick, the firmly chartaceous endocarp very shallowly engraved externally.

Related to S. sagotiana (Eichl.) Diels and S. eichleriana Mold., resembling both in the cordate, 5--7-plinerved leaf-blades but different in the smooth upper leaf-surface, all venation beyond the primary and one or two secondary veins arising from the midrib being fully immersed on the upper face. The pubescence of the blade's lower face is simply erect-pilosulous, as in S. eichleriana, not entangled as in S. sagotiana. In outline the blade is narrower than that of S. eichleriana and only 5 (not 7--9)-nerved from entry of the petiole. In shape, texture and venation the leaf of S. peruviana resembles that of S. (§ Tylopetalum) solimoesana Mold. more nearly than that of any member of its own sect. Sychnosepalum which is characterized by a velvety-pilosulous, not minutely furfuraceous vestiture throughout the pistillate inflorescence and drupe.

7. Sciadotenia sprucei Diels, Pflanzenreich 4(94): 84. 1910.

Brazil: Para: Serra do Cachimbo, Cuiabá-Santarem highway, Prance 25506 (km 1135), 25598 (vicinity of Igarapé Kazuo, km 1221).

Both collections are from terra firme.

12. Sciadotenia amazonica Eichler, Flora 47: 395. 1864 & in Martius, Fl. Bras. 13:201, Tab. 47, Fig. 3. 1864.

Peru: Loreto: Maynas, near Iquitos, Juan Revilla 115.

19. Sciadotenia sp.

Brazil: Para: Serra do Cachimbo, Cuiabá-Santarem highway, km 1300, terra firme, Prance 25705.

This collection might represent a new species which cannot be described however as it is sterile.

V. Telitoxicum Moldenke in Krukoff & Moldenke, Brittonia 3: 42. 1938.

1. Telitoxicum minutiflorum (Diels) Moldenke in Krukoff & Moldenke, Brittonia 3: 49. 1938.

Brazil: Acre: Cruzeiro do Sul, N. A. Rosa 744 (IAN), O. P. Monteiro 338 (INPA); Rondônia: S. Pacas Novos, N. A. Rosa 876 (MG).

This is the first record of the species from Acre.

8. Telitoxicum rodriguesii Krukoff, Phytologia 33: 329. 1976.

Brazil: Amazonas: Manaus, Prance 1974/s.n., J. M. de Albuquerque 48 (INPA) (estrada do Aleixo, campus do INPA).

VI. Abuta Barrere ex Aublet, Pl. Guian.
1: 618. Pl. 250. 1775.

1. Abuta rufescens Aublet, Hist. Pl. Guian. 1: 618. Pl. 250. 1775.

Abuta splendida Krukoff & Moldenke, Bull. Torrey Club 68: 241. 1941.

French Guiana: C. Moretti 816 (CAY), (River Marouini), de Granville 2706 (CAY) (Saül, trace Orstom-Belvédère Nord, à 300 m environ on Nord du sommet à proximité de la parcelle Orstom, liane, 10 cm in diam. Brazil: Para: Serra de Carajas, 13 km from Amza headquarters, terra firme, A. C. Silva 58.

It is most satisfactory that after repeated attempts since 1970 two collections of Abuta rufescens from French Guiana became available to us: C. Moretti 816, and de Granville 2706. They were from enormous vines and their collection proved to be difficult.

In Supplementary Notes VIII, under A. rufescens (Mem. NYBG, 22: 37-41. 1970) we discuss at length the difficulties of the typification of A. rufescens. In addition, all classic accounts and plates of this species have been contaminated by elements of other species. We suggest that perhaps "A. splendida" is a synonym of A. rufescens but refrained from reducing it to synonymy at that time in the absence of specimens from French Guiana.

4. Abuta grisebachii Triana & Planchon, Ann. Sci. Nat. IV, 17: 47. 1862.

Brazil: Amazonas: J. M. de Albuquerque 46 (INPA) (Manaus), Prance 24381 (Rio Solimoes, 1 km above mouth of Rio Careiro).

5. Abuta candollei Triana & Planchon, Ann. Sci. Nat. IV. 17: 47. 1862.

Brazil: Roraima: Rio Univini, Pires et al. 14237 (IAN).

This is the first record of this species from Roraima.

6. Abuta aristeguietae Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(2): 21. 1970.

Venezuela: Parque Nacional El Avila, Pico Naiguata, + 1500 m, Bruno Manara s.n. (Aug. 26, 1976) (VEN).

7. Abuta steyermarkii (Standley) Standley, Field Mus. Publ. Bot. 23: 156. 1944.

Guatemala: Alta Verapaz: San Juan Chamelco, M. R. Wilson 40902 (F).

9. Abuta pahni (Martius) Krukoff & Barneby, Mem. N. Y. Bot. Gard. 22(2): 43. 1971.

Venezuela: Mérida: Mesa Bolívar, Santiago López-Palacios 1615 (VEN) (alt. +1200 m), 2209 (alt. + 700 m). Peru: San Martin: Mariscal Cáceros, Tocaché Nuevo, José Schunke V. 9834.

11. Abuta barbata Miers, Contr. Bot. 3:83. 1871.

French Guiana: Oldeman 3092 (CAY) (River Yaroupi), de Granville 2705 (CAY) (Saul, dense forest, big woody vine).

13. Abuta imene (Martius) Eichler, Flora 47: 389. 1864.

Peru: Loreto: upper Rio Mazán, Al. Gentry 16534.

15. Abuta panurensis Eichler, Flora 47: 390. 1864.

Brazil: Amazonas: David S. Conant 1160 (INPA) (Manaus).

17. Abuta velutina Gleason, Bull. Torrey Club 58: 361. 1931.

Brazil: Para: Serra do Cachimbo, Transamazon highway, 90 km NE of Itaituba, Prance 25842.

21. Abuta sandwithiana Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(2): 18. 1970.

Male inflorescences and flowers of this species are described for the first time (Gentry 18511):

Inflorescence narrowly racemose-paniculate from serial buds supra-axillary to coeval lvs., minutely gray-pilosulous throughout, the primary axis 3--5 mm; sepals ovate deltate, the 3 outer ± 0.4 mm, the 3 inner 1.5 mm; androecium 6-merous, the slightly dilated filaments 0.7-0.8 mm, free from base, the vertically dehiscent anthers 0.2 mm.

French Guiana: Grenand 18 (CAY) (creek Kanikari), 1350 (CAY). Brazil: Amazonas: F. Mello s.n. (17/4-1976) (INPA); Magnago 113 (INPA) (Lago Miua); Acre: Cruzeiro do Sul, L. R. Marinho 291 (IAN).

These are the first records of the species from French Guiana and Acre.

24. Abuta racemosa (Thunberg) Triana & Planchon, Ann. Sci. Nat. IV. 17: 48. 1862.

Panama: Canal Zone: Gene Montgomery s.n. (25/10-1975) (MO).

25. Abuta panamensis (Standley) Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(2): 22. 1970.

Mexico: Chiapas: alt. ± 550 m, Breedlove 20745 (MO). Costa Rica: Alajuela: Zapote de Alfaro Ruiz, Finca Los Ensayos, H. Barquero s.n. (10/22-1977).

27. Abuta grandifolia (Martius) Sandwith, Kew Bull. 1937: 397. 1937.

Brazil: Para: Serra dos Carajas, B. G. S. Ribeiro 1341 (IAN). In addition, seven other collections in Para, Brazil, in Serra Cachimbo region were collected: Prance 24790 (Cachoeira do Curua), 25348 and Berg 764 (Cuiabá-Santarem highway, km 934), Prance 25860, C. C. Berg 470 & 559 (Serra dos Carajás, Serra Norte), A. C. Silva 118 & 171. Amazonas: M. Silva s.n. (16/8-1977) (INPA) (Manaus), L. R. Marinho 515 (IAN) (Rio Negro), L. F. Coelho 464 (INPA) (Rio Teá), Magnago 105 (INPA) (Lago Miua), F. Mello s.n. (08/04-1976) (INPA) (Lago do Piaurini), B. de Albuquerque 896 (INPA) (Lago do Castanha-Mirim), J. Ramos 395 (INPA) (Fonte Boa), S. A. Mori 9000 (Coari), 9080 (Coari) Padre Leopoldo Krieger 12493 (INPA) (Tefé) J. Ramos 281 (INPA) (Cruz-

eiro do Sul), 287 (Cruzeiro do Sul); Rondônia: M. R. Cordeiro 572 (IAN), N. A. Rosa 819 (IAN). Peru: Loreto: Rio Javari, Prance 24161 (INPA). Bolivia: Beni: Triunfo Rio Matos, E. Myrt 100 (MO). Ecuador: near Guayaquil, Thaddeus Haenke 2269 (F), Napo: B. MacBryde 1342 (MO).

29. Abuta dwyerana Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(2): 73. 1970.

Costa Rica: Cartago: 2 km W of Orosi, +1400 m, Roy W. Lent 4077. Panama: Colón: T. B. Croat 34314.

- The first record of the species from Costa Rica & Colon.
30. Abuta longa Krukoff & Barneby, Mem. N. Y. Bot. Gard. 20(2): 21. 1970.

Venezuela: Distrito Federal: Parque Nacional El Avila, Naiguata, B. Manara s.n. (5/7-1977) (VEN); Delta Amacuro: Rio Cuyubini, Cerro de Paloma, alt. 100-200 m, Steyermark 87638 (VEN).

The first record of the species from Distrito Federal and Delta Amacuro. It was known previously from two collections from the State of Miranda.

32. Abuta sp.

Colombia: Chocó: Rio San Juan, just below Tadó, +100 m, Al Gentry & Mary Fallen 17731.

This is the second sterile collection of a species which cannot be described in absence of flowers and or fruits. The vegetative parts of the first collection were described in Supplement XI (Lloydia 33: 333. 1976).

33. Abuta sp.

Colombia: Chocó: vicinity of Unguia, +50 m, Al Gentry 16723 (NY).

This sterile collection probably represents a species of Abuta, to be described when flowers or fruits can be obtained.

Vine; branchlets of the season with petioles and midrib of leaves on both faces densely tomentose-pilose with loose contorted hairs; petioles 2.5--5 cm; leaf-blades chartaceous, plane, glabrous between principal veins, in outline ovate short-acuminate subcordately rounded at base 11--15 x 7--8.5 cm, 3-plinerved from insertion of petiole, the 2 lateral nerves incurved-ascending to + middle of blade, the midrib giving rise

from below middle upward to 3--4 incurved-ascending secondaries, all these with fine tertiary connecting venules faintly prominent above, sharply so beneath, the reticulation of both faces slightly more sharply defined above than beneath, the larger areoles of upper face ± 0.2 mm, those of lower face up to 0.4 mm diam.

VIII. Anomospermum Miers, Ann. Nat.
Hist. III, 14: 101. 1864.

- 4b. Anomospermum chloranthum Diels spp. confusum Krukoff & Barneby, Mem. N. Y. Bot. Gard. 22(2) 69. 1971.

French Guiana: Grenand 1106 (CAY) (Haut Oyapock, Trois Sauts), J. J. de Granville 2708 (Saul, grand liane).

- 5a. Anomospermum reticulatum (Martius) Eichler ssp. reticulatum, Mem. N.Y. Bot. Gard. 22(2): 73. 1971.

Brazil: Amazonas: lower Rio Negro, Pires 13886 (MG), basin of Rio Solimoes, S. A. Mori 9139 (Rio Jandiatuba), 9204 (Igarapé Preto, near Belém).

- 5f. Anomospermum reticulatum (Martius) Eichler ssp. venezuelense Krukoff & Barneby, Mem. N. Y. Bot. Gard. 22(2): 76. 1971.

Venezuela: Yaracuy: Sierras cerca de Aroa ± 800 m, R. F. Smith 6207 (VEN).

This is the third collection of this subspecies. It was previously known from the States of Miranda and Mérida.

IX. Orthomene Barneby & Krukoff, Mem.
N. Y. Bot. Gard. 22(2): 79. 1971.

1. Orthomene schomburgkii (Miers) Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22(2): 80. 1971.

Venezuela: Amazonas: Paul E. Berry 667 (VEN). Surinam: Hostman & Kappler s.n., Irwin 55429 (Maguire number). French Guiana: Moretti 499, 800 (CAY). Brazil: Amazonas: N. A. Rosa 529 (IAN) (Rio Negro), L. F. Coêlho 558 (INPA) (Rio Negro), O. F. Monteiro 820 (INPA) (road Manaus - Porto Velho), Prance 11866 (INPA) (Rio Ituxi, basin of Rio Purus); Rondonia: km 20 on road to Saldanha, J. H. Krikbride et al. 2742, Peru: Loreto: Juan Revilla 310 (Rio Momón), 988 (Rio Ampiyacu), Al. Gentry 16527 (upper Rio Mazán), 16639 (Rio Mazán).

3. Orthomene hirsuta (Krukoff & Moldenke) Barneby & Krukoff, Mem. N. Y. Bot. Gard. 22: 81. 1971.

Brazil: Para: Cuiaba-Santarem highway, km 1225, terre firme, Prance 25604.

This is the first record of this species from the State of Para.

- X. Elephantomene Barneby & Krukoff
Lloydia 37: 27. 1974.

1. Elephantomene eburnea Barneby & Krukoff, Lloydia 37: 28. 1974.

French Guiana: Saul: plateau la Douana, S. Mori & J. J. de Granville 8780. This is the third collection of this species, probably from the same plant as de Granville 2704. Seeds of this collection germinated many months after they were sown at N. Y. Botanical Garden.

Changes in the Identifications

| | Cited originally as | Cited later as |
|--------------------------|---|--|
| M. Silva & R. Silva 2366 | <u>Orthomene</u> <u>schomburgkii</u> 10 suppl.:27 | <u>Anomospermum</u> <u>reticulatum</u> ssp. diels- ianum 13 suppl. |

Bibliography

(In order to conserve space, we are citing only the papers which are not cited in Supplement VII-XI).

1. Krukoff, B. A. Supplementary notes on American Menispermaceae XII. Neotropical Triclisieae and Anomospermeae. Phytologia 36: 12-16. 1977.

List of Exsiccatae

The first list of Exsiccatae covering our papers on Menispermaceae including Supplement VIII was published in Mem. N. Y. Bot. Gard. 22: 1-89. 1971. The second list of Exsiccatae covering Supplements IX, X and XI was published in Phytologia 33: 337-340. 1976. The present list of Exsiccatae covers Supplements XII and XIII. The number in parenthesis correspondes with the species - number of this and other papers (Supplements VIII to XII). Only numbered collections and those of which the dates of collection are recorded have been listed. If a collector gathered his collection together with others, only his name is cited in this list. Collections with Dr. Prance's numbers are cited under Prance.

Albuquerque, Byron W. P., de, 896 (A27).

Albuquerque, J. M., de, 46 (A4), 48 (T8).

Anderson, W. R., 10861 (AN7).

Barquero, Humberto, 1977/1 (A6), 1977/2 (A6), s.n. (10/22-77) (A25).

Berg, C. C., 470 (A27), 559 (A27), 764 (A27).

Bernardi, A. L., 5841 (AN5).

Berry, Paul E., 667 (01).

Breedlove, 20745 (A25), 23348 (A25), 30779 (A25).

Cabrera, I., 3650 (A27), 3656 (CH1).

Coelho, L., 464 (A27), 558 (01).

Conant, David S., 1160 (A15).

Cordeiro, M. R., 531 (AN5a), 563 (AN7), 572 (A27), 634 (A17).

Cremers, 1415 (S1).

Croat, T. B., 34314 (A29).

D'Arcy, W. G., 9301 (A29).

Gentry, A1., 14301 (A9), 14506 (A17), 15863 (01), 16527 (01), 16534 (A13), 16639 (01), 18505 (CU1), 18511 (A21), 19006 (CU3).

Granville, de, 2649 (CU2), 2704 (E1), 2705 (A11), 2706 (A1), 2708 (AN4b), 2709 (CU2), 2729 (S6), 5189 (S1).

Grenand, 18 (A21), 1006 (AN4b), 1350 (A21).

Haenke, Thaddaeus, 2269 (A27).

Halle, Fr., 2225 (S1).

Hatschbach, G., 35974 (A27).

Herbarium Jard. Botan. Rio, 140813 (A14).

Hostmann, W. R., s.n. (01).

Irwin, H. S., 55429 (01) (Maguire number).

- Kirkbride, J. H., Jr., 2742 (01).
Krieger, Padre Leopoldo, 12493 (A27).
Lent, Roy W., 2984 (A25), 4077 (A29).
López-Palacios, Santiago, 1615 (A9), 2209 (A9).
MacBryde, B., 1342 (A27).
Magnago, 105 (A27), 113 (A21).
Maguire, B., 55429 (01).
Manara, Bruno, s.n. (8/26-1976) (A6), s.n. (5/7-1977) (A30).
Marinho, L. R., 133 (T1), 291 (A21), 384 (01), 515 (A27).
Martin, Richard T., 1650 (A27), 1696 (A27), 1752 (A27),
1760 (A27).
Mello Filho, Luiz Emygdio de, s.n. (17/4-1976) (A21), s.n.
(8/4-1976) (A27).
Monteiro, O. P., 338 (T1), 820 (01).
Montgomery, Gene, s.n. (25/10-1975) (A24).
Moretti, C., 454 (S1), 499 (01), 800 (01), 808 (S1), 816 (A1),
843 (S1).
Mori, S., 7946 (CU1), 8620 (CU2), 8771 (S1), 8780 (E1), 8803
(S1), 9000 (A27), 9139 (AN5a), 9204 (AN5a).
Mywt, E., 100 (A27).
Oldeman, R. A. A., 3092 (A11).
Philcox, D., 4571 (A27).
Pires, João Murça, 13886 (AN5a), 14754 (A27).
Plowman, T., 2521 (A27), 6032 (CH1).
Prance, G. T., 9080 (A27), 11866 (01), 21280 (S9), 24161 (A27),
24381 (A4), 24790 (A27), 25348 (A27), 25506 (S7), 25598
(S7), 25604 (01), 25705 (S19), 25842 (A17), 25860 (A27),
1974/s.n. (T8).
Ramos, J., 281 (A27), 287 (A27), 395 (A27).
Revilla, Juan, 115 (S12), 310 (01), 445 (CU1), 988 (01).
Ribeiro, B. G. S., 1299 (AN5a), 1341 (A27).
Rosa, N. A., 529 (01), 744 (T1), 819 (A27), 876 (T1).
Sastre, C., 1601 (A27), 1607 (A27), 1668a (A27), 1785 (A27).
Schomburgk, Richard, 107/696 (A27).
Schunke, V., José, 41 (A16), 45 (S2), 47 (S2), 49 (A9), 50 (A9),
51 (A16), 8143 (A17), 8260 (CH1), 9834 (A9), 9835 (S2), 9836
(S2).
Silva, A. C., 58 (A1), 118 (A27), 171 (27).
Silva, M., 2366 (AN5b), s.n. (16/8-1977) (A27).
Smith, R. F., 6207 (AN5F).
Sparre, Benkt, 13082 (A27).
Steyermark, J. A., 87638 (A30).
Wilson, Michael R., 40902 (A7).

NOTES ON THE SPECIES OF ERYTHRINA. XI

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Six papers were published as Erythrina Symposium II in LLOYD (Sept./Oct. 1977). Seven or eight additional papers are planned for publication early in 1979 as Erythrina Symposium III. I plan to submit for this Symposium a brief paper, reserving the present one for information which is best published separately.

In connection with projected genetical work on Erythrina in Hawaii and California, three lists were compiled: the first of especially handsome species which might be considered for cultivation or as breeding stock in development of attractive hybrids for cultivation; the second of species which are tolerant of or resistant to frost, some of which might be used for breeding frost-tolerant hybrids for cultivation in California, and the third of species, some of which might be of interest for cultivation in certain areas in Hawaii deficient in rainfall and/or for hybridization. An attempt is also being made to compile lists of species which are cultivated in Hawaii and California with pertinent information on the exact location of each plant, the season when they are usually in flower, etc., to facilitate the planning of genetical work. Vouchers for these plants will be identified and deposited in the Herbaria of N.Y. Botanical Garden and/or Hawaii, and/or California. The first list for some of Erythrinas cultivated in California is already prepared.

A rather extensive collection of Erythrinas cultivated in Australia was received on loan from MEL. In the same Herbarium I found a rather extensive collection of Erythrinas from New Caledonia. Such an extensive collection was not seen by me in any Herbarium in Europe or elsewhere.

271 new collections were examined in connection with the preparation of this paper. No novelties are described in this paper as these as well as the extensions of range of various species are reserved for the next Supplement.

1. Erythrina fusca Loureiro, Fl. Cochinch. 427. 1790.

Twenty eight new collections of this wildly distributed species were examined. From the Old World they are: one from Malay, one from Caledonia, one from Samoa, three from New Guinea, two from Solomon Islands, one from New Hebrides; and from the New World: one from Belize, one from Honduras, one from Panama, one from Venezuela, four from Brazil, two from Peru, one from

Ecuador; also three from trees cultivated in Australia (Queensland, Daintree) and three from trees cultivated in India.

2. Erythrina crista-galli L. Mant. 99. 1767.

Thirteen new collections were examined: six from Brazil (Federal District, Minas Geraes and São Paulo), also seven from cultivated plants (one from U.S.A., one from Hawaii, one from New Guinea and four from Australia.)

3. Erythrina falcata Benthham in Mart. Fl. Bras. 15(1):172. 1859.

Brazil: São Paulo: H. Leitão Filho s.n. (24/7-1968); Rio de Janeiro: Pabst 7369 (K), Sello s.n. (Mel. 77266 (MEL)). Peru: Cuzco: P. Clark s.n. (Nov. 1, 1969) (F), also one collection from a plant cultivated in Australia (BRI).

5. Erythrina ulei Harms, Verh. Bot. Ver. Brand. 48:172. 1907.

Brazil: Rondonia: Rio Pacas Novos, Cavalcante 3287 (MG). Peru: Junín: Prance 23714 (MO), A. Lourteig 3089 (P).

6. Erythrina verna Velloso, Fl. Flum. 304. 1825.

Brazil: São Paulo: Ribeiro Preto, H. Leitão Filho 468. (flrs. collected in August).

7. Erythrina poeppigiana (Walpers) O.F. Cook in Bull. U. S. Dept. Agr. Bot. 25:57. 1901.

Colombia: Cauca: alt. +1100 m, Idrobo 207 (US). Venezuela: Barinas: Bernardi 6299 (alt. +110 m (MER), H. Jiménez Soa 1297 (MER); Miranda: Bernardi 5800 (+150-200 m). Brazil: Acre: basin of Rio Purús, opposite boca do Acre, Prance 2385 (MG). Hawaii: cult., K. Nagata 808 (HLA).

8. Erythrina suberosa Roxburgh, Fl. Ind. 3:253. 1832.

India: L.J.G. van der Maesen 1976 (K) (Maharashtra), Mel. 77277 (MEL) (Dehra Dun), Kharag Singh 15 (MEL) (Kalsi), Mel. 77294 (MEL).

10. Erythrina stricta Roxburgh, Hort. Beng. 53: nomen. 1814: Fl. Ind. 3:251. 1832.

India: Assam: A. C. Chatterjee s.n. (1902) (MEL).

12. Erythrina arborescens Roxburgh, Pl. Coromandel 3:14, pl. 219. 1819.

Nepal: S of Charsa, G. Wilson 863 (K). India: Mel. 77228 (MEL) (Mont. Khasia, alt. 1300-1600 m), Mel. 77227 (MEL) (Sikkim)

13. Erythrina subumbrans (Hasskarl) Merrill in Philipp. Jour. Sci. Bot. 5:113. 1910.

Nine new collections were examined: two from India, two from Ceylon, one from Thailand, one from Burma, one from Sumatra, one from Philippines and one from a tree cultivated probably in Australia.

14. Erythrina breviflora A.DC., Prodr. 2:413. 1825.

Mexico: Michoacán: cool oak-pine forest, alt. +2300 m, Barneby 17779.

15. Erythrina edulis Triana; M. Micheli, Jour. de Bot. 6:145. 1892.

Colombia: Cundinamarca: alt. 2000-2350 m, Al. Gentry 17129 (MO); Antioquia: San Andrés, Santiago López-Palacios 1557 (MERF). Peru: Cuzco: Urubamba, +2800 m, R. Chávez Alfaro 3411 (MO); Amazonas: Chachapoyas: J. D. Boeke 2084. Ecuador: Napo: J. D. Dwyer 9588 (alt. +1900 m), P.J.M. Maas 3049 (U) (alt. +1800-2000 m), J. D. Boeke 378 (alt. +1850 m).

16. Erythrina speciosa Andrews, Bot. Repos. 7:pl. 443. 1806.

Seven new collections were examined: one from Bahia and another from Rio de Janeiro, Brazil, and five from cultivated plants, one from Hong Kong and four from Australia.

20. Erythrina leptorhiza A.DC., Prodr. 2:413. 1825.

Mexico: México: Cerro Texcotzingo, alt. 2300-2400 m, Mario Sousa 5718 (US).

21. Erythrina horrida A.DC., Prodr. 2:413. 1825.

Mexico: Oaxaca: alt. +3400 m, G. L. Webster 15324 (F).

- 22a. Erythrina herbacea L. subsp. herbacea. Erythrina herbacea L. Sp. Pl. 706. 1753 sens. str.

Twelve new collections were examined: seven from the U.S.A., and five from plants cultivated in Australia.

- 22b. Erythrina herbacea L. subsp. nigrorosea Krukoff & Barneby in Phytologia 25(1):6. 1872.

Mexico: Tamaulipas: N. A. Harriman 10881 (F); Veracruz: Mario Sousa 3329 (Tuxtla), Guadalupe: Martinez-Calderon 1383 (F); Michoacan: Mario Sousa 8014 (alt. ± 1050 m); Oaxaca: T. Mac-Dougall H322, Oswaldo Tellez 357 (Tuxtepec), 407 (Tuxtepec), Mario Sousa 5506 (6 km SE of Cacahuatpec), 6999 and 7021 (from Putla) and 7056; also Mel. 77235 (MEL) from a plant cultivated probably in Australia.

23. Erythrina standleyana Krukoff in Brittonia 3:301. 1939.

Belize: dist. Orange Walk, T. Arnason 17161 (MO).

25. Erythrina coralloides A.DC., Prodr. 2:413. 1825.

Mexico: Hidalgo: NE of Zimapan, H. E. Moore Jr. 4272 (MICH); Puebla: Cholula, F. Nicolai 5876 (MEL); also one from a tree cultivated in Los Angeles.

- 28b. Erythrina lanata Rose subsp. occidentalis (Standley) Krukoff & Barneby in Phytologia 27:117. 1973.

Mexico: Jalisco: Howard 23529 (MICH), (alt. ± 700 m), R. McVaugh 25300 (MICH) (alt. 90-150 m), W. R. Anderson 6069 (MICH) (alt. ± 100 m).

30. Erythrina caribaea Krukoff & Barneby in Phytologia 25:9. 1972.

Mexico: Campeche: alt. 300-400 m, John D. Shepherd 156 (MICH).

31. Erythrina folkersii Krukoff & Moldenke in Phytologia 1:286. 1938.

Belize: J. D. Dwyer 9826 (F) (Colombia Forest Station), 11148 (MO) (Toledo), 12507 (MO), (district Cayo).

33. Erythrina smithiana Krukoff in Brittonia 3:323. 1939.

Ecuador: Guayas: alt. ± 50 m, Dodson 719 (MO).

42. Erythrina macrophylla A.DC., Prodr. 2:411. 1825.

Honduras: Ocotepeque: alt. 1900-2000 m, Antonio Molina R. 30987 (EAP), 31287 (EAP), 31397 (EAP).

49. Erythrina lanceolata Standley in Contr. U. S. Nat. Herb. 17:432. 1914.

Honduras: Ocotepeque: alt. +1300 m, Antonio Molina 30942 (EAP); El Paraiso: Near the Nicaraguan border, alt. +1200 m, L. O. Williams 42252 (F). Costa Rica: San José: B. G. Schubert s.n. (Jan. 14, 1956).

50. Erythrina costaricensis M. Micheli, Bull. Herb. Boiss. 2:445. 1894.

Costa Rica: San José: Croat 32927 (MO), 35377; Cartago: alt. +2500 m, G. L. Webster 12147 (MO). Panama: Canal Zone: W. C. D'Arcy 9265 (MO); Darién: Cerro Tacarcuna, alt. 1100-1300 m, Al. Gentry 16880 (MO).

52. Erythrina americana Miller, Gard. Dict. ed. 8, No. 5. 1768.

Mexico: Veracruz: Brigada Vásquez 438 (F), 577 (F), Refugio Cedillo Trigos 3 (munic. Catemaco).

53. Erythrina berteriana Urban, Symb. Ant. 5:370. 1908.

Honduras: Copán: L. O. Williams 42946 (F) (alt. +650 m); Comayagua: Antonio Molina R. 31475 (EAP) (alt. 300 m). Costa Rica: San Jose: along Río Virgilio, alt. +1400 m, John Taylor 17311. Panama: Canal Zone: Al. Gentry 1905 (F), J. E. Ebinger 854 (F), Panamá: Croat 34673 (MO), J. A. Duke 5694 (MO); Veraguas: Croat 33835 (MO). Peru: cult. J. Schunke V. s.n. (Aug. 13, 1977). U. S. A.: cult. Los Angeles, five collections.

54. Erythrina rubrinervia H. B. K. Nov. Gen. & Sp. 6:434. 1824.

Venezuela: Barinas: Carderas, Bernardi 6859 (MER); Trujillo: alt. +1800 m, Luis Ruiz-Terán 2231 (MER).

56. Erythrina salviiflora Krukoff & Barneby in Phytologia 25:14. 1972.

Hawaii: Lyon Arboretum, cult., Kenneth Nagata 810 (HLA).

58. Erythrina gibbosa Cufodontis, Arch. Bot. Sist. Fitog. & Genet. 10:34. 1934.

Costa Rica: Alajuela: 900 m, R. W. Lent 3892.

62. Erythrina mitis Jacquin, Hort. Schoenb. 2:47. 1797.

Venezuela: coll. undesigned s.n. (March 1978); Miranda:

Guatopo, 400-600 m, Bernardi 5852 (MER); Merida: Luis Ruiz-Terán 4832 (alt. +1650 m) (MER), 11851 (alt. 200-250 m) (MER), 14832 (alt. +1650 m) (MER), López-Palacios 1723 (MERF); Bolívar: alt. +80 m, Bernardi 8046 (MER).

64b. Erythrina corallodendrum var. bicolor Krukoff in Brittonia 3:275. 1939.

One specimen of this variety from a plant cultivated in Australia was examined (BRI).

71. Erythrina caffra Thunberg, Prodr. Pl. Cap. 121. 1800.

Five specimens of this species were examined: one from eastern Cape, South Africa and four from plants cultivated in Australia (BRI).

72. Erythrina lysistemon Hutchinson in Kew Bull. 1933:422. 1933.

Ten collections of this species were examined: one from Mozambique, two from Natal, two from Transvaal, S. Africa, and five from cultivated plants, one from Ethiopia and four from Australia.

73. Erythrina humeana Sprengel, Syst. 3:243. 1826.

South Africa: Transkei, R. G. Strey 11155 (K), also two from cultivated plants, one in Australia and one at Kew.

74. Erythrina zeyheri Harvey, Fl. Cap. 2:236. 1862.

S. Africa: W. J. Hanekom 2454 (MO), Mel. 77252 (MEL).

75. Erythrina acanthocarpa E. Meyer, Comm. Pl. Afr. Austr. 1:151. 1836.

Australia: cult., Mel. 77226, 77248, 77249, 77253, 77254, 77288, 77293, all received on loan from MEL.

77. Erythrina brucei Schweinfurth, Verhand. Zoo.-Bot. Gesell. Wien 18:653. 1868. et auct. plur., pro maiore parte, leguminibus seminibusque exceptis; emend. Gillett, Kew Bull. 15:428. 1962.

S.W. Ethiopia: D. R. C. Haffey 329 (K), (Sidamo), A. C. B. Thomerson 789 (K) (Kaffa), (23/1-flrs), E. Westphal 3150 (MO) (road from Dilla to Yerza, 21 km from Dilla, many trees along road, alt +1890 m). Kenya: Kiamba Distr., cult., J. B. Gillett 20963 (K).

91. Erythrina saclexii Hua in Bull. Soc. Linn. Paris n.s. 1:54. 1898.

Kenya: Buda Forest, Faden 74/294 (MO).

94. Erythrina latissima E. Meyer, Comm. Pl. Afr. Austr. 1:151. 1836.

S. Africa: Mel. 77263 (MEL); Natal: E. Thorp NH59824 (K), s.n. (K), Brown & Shapiro 380 (MO), Kraurs s.n. (Mel. 77264) (MEL).

95. Erythrina abyssinica Lamarck, Encycl. Bot. 2:392. 1788; DC. Prodr. 2:413. 1825.

Angola: Golungo Alto, Welwitsch 2230 (MEL). Uganda: A. B. Katenda K 1171 (K) (Bugonzi), K2004 (MO) (west of Kampala grassland). Tanzania: Mufindi Distr., R. E. Perdue 11017 (K). Ethiopia: Tigre Province, Aweke & Gilbert 783 (K), also four specimens from trees cultivated in Australia, and one in Africa.

96. Erythrina variegata L. Herb. Amboin. 10. 1754. Amoen.Acad. 4:122. 1759.

Twenty two new collections were examined: six from New Guinea, one from New Britain, one from Solomon Islands, one from New Caledonia, two from Samoa and one from Fiji, also ten from cultivated plants, seven from Australia (MEL), three from Hawaii (HLA) and one from India.

97. Erythrina tahitensis Nadeau, Enum. Pl. Tahiti 80. 1873.

Eleven new collections were examined, all from Hawaii (HLA).

99. Erythrina vespertilio Benthham in Mitch. Jour. Trop. Austr. 218. 1848.

Australia: Queensland: +20 km S. W. of Cape York, L. S. Smith 12671 (typical form), S. T. Blake 23394 (K). Western Australia: A. Morrison s.n. (K). Northern Territory: Alice Springs, J. R. Maconochie s.n. (1977) (biloba form). Northern Queensland: T. Dune s.n. (July 3, 1969) (Hannibal Island) (island form), H. Lawrie s.n. (Sept. 1977) (Coconut Island) (island form), D. R. Stoddart s.n. (Bird Island) (island form); also Mel. 77231 (MEL), 77232 (MEL), 77233 (MEL) all these three collections are from trees cultivated in Australia and all are of the island form. New Guinea: Morobe District, cult., Verdcourt & Herty 4902 (K).

Stoddart collection made in November is from a dominant

tree, 10-15 m high, leafless and with orange flowers and fruits.

101. Erythrina merrilliana Krukoff in Jour. Arnold Arb. 20:227. 1939.

New Guinea: Morobe District: J. J. Havel 17007 (alt. +1130 m) (lvs. & frts. - Nov.), McViegh 7336 (alt. +1000 m) (flrs. & frts. - Nov., leafless), A. N. Millar 35194 (alt. +1300 m) (flrs. - Sept.).

102. Erythrina velutina Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3:426. 1801.

Venezuela: Federal District: cult., G. Morillo 2364.
Brazil: Bahia: A. P. Duarte 10594; Federal District: near Brasilia, E. P. Heringer 12235 (MO), 12937 (MO), 14750 (MO), 14751 (MO); Sao Paulo: Campinas, cult., H. Leitao Filho 564 & 565.

104. Erythrina burttii Baker f. in Jour. Bot. 70:254. 1932.

Kenya: R. M. Lawton 1795 (K) (Kilili-Macumba area), A.L.P.K. 1 (K) (Marsabit District).

105. Erythrina burana R. Chiovenda, Att. R. Accad. Ital., Mem. Sc. Fis. Mat. & Nat. 11:27. 1940.

Kenya: cult., W. G. Dyson 709 (K).

- 108a. Erythrina melanacantha Taubert ex Harms in Ann. Ist. Bot. Roma 7:96. 1897, ssp. melanacantha.

Tanzania: Tanga: Pare Distr., P.R.O. Bally 16373 (K).
Kenya: Major P. Latham 16217, Faden 74/286 (MO).

Hybrids

7. Erythrina x sykesii Barneby & Krukoff in Lloydia 37:447. 1974.

Australia: R. M. O'Mara s.n. (May 1970), L. S. Smith 10478, M.C.A. Hamilton s.n. (Sept. 17, 1971), Sabina Helmes 1447 (US).

These collections are from cultivated plants.

Species of Erythrina, especially handsome, which might be considered for cultivation or for breeding as one of the parents to develop attractive hybrids for cultivation.

5. E. ulei Harms. This large tree, leafless when in flower, and native to Peru, Colombia, Ecuador, Bolivia and Brazil at elevations of 400-1500 m, is very handsome.

6. E. verna Velloso. This large tree, also leafless when in flower and native to the lowlands of central and southern Brazil and eastern Bolivia, is probably the most attractive species of the genus in South America.

40. E. tajumulcensis Krukoff & Barneby. A large tree native to Guatemala (San Marcos) and Mexico (southern Chiapas), occurring at moderately high elevations, is probably the most colorful Erythrina in Central America.

46. E. florenciae Krukoff & Barneby. A huge tree reaching +25 m high, +1 m in diam occurs in a belt of the humid high forest above +1650 m in Guatemala (San Marcos) and Mexico (Oaxaca, Chiapas). It is strikingly handsome.

81. E. mildbraedii Harms. Probably the most handsome Erythrina in tropical Africa. One of the largest species in the genus, up to 36 m high and 1 m in diam. Its flowers are pale rose.

103. E. grisebachii Urban. Large tree endemic to Cuba and often grown as a street tree there, with spectacular large flowers. The only Erythrina on this list which probably will grow in areas with deficient rainfall.

NOTE:

13. E. subumbrans (Hasskarl) Merrill. This medium size tree is not a too attractive ornamental but is unique in having samaroid pod. It would be interesting to include this in genetical studies.

48. E. huehuetenangensis Krukoff & Barneby. Is not an attractive Erythrina but it is interesting to include this in genetical studies as it has soft seeds, often germinating in pods on trees or immediately after falling to the ground.

Species of Erythrina which are tolerant or frost resistant, some of which might be considered for breeding to develop frost-tolerant hybrids for cultivation in California.

2. E. crista-galli L. This species extends farther south in South America than any others.
11. E. resupinata Roxburgh. It is a small perennial herb with thickened root, extending farther north in Indian Himalaya than any other species.
12. E. arborescens Roxburgh. This species extends farther north in China than any other species. It is the only species which is found to the north of the Tropic of Cancer.
14. E. breviflora A.DC.
- 14a. E. breviflora forma petraea (Brandeggee) Krukoff.
- 14b. E. breviflora forma oaxacana Krukoff.

These are found on a high elevation (1050-2100 m) in Mexico. They are small shrubs.

15. E. edulis Triana. Some forms of this species are found on the elevations of up to 2700 m in subAndean Colombia, Peru and Ecuador.
19. E. montana Rose & Standley.
20. E. leptorhiza A.DC.
21. E. horrida A.DC.

These are perennial herbs with thickened root. They are found on high elevations (1500-2700 m) in Mexico.

24. E. flabelliformis Kearney. This small shrub extends farther north in North America than any others.
42. E. macrophylla A.DC. This rather handsome large tree is found at elevations of up to 2700 m in Guatemala and certain other countries of Central America.
71. E. caffra Thunberg.
72. E. lysistemon Hutchinson.

These two species extend farther south in Africa than any other species.

Species of Erythrina which are growing in areas deficient in rainfall. Some of these might be of interest for cultivation in certain areas in Hawaii deficient in rainfall and/or for hybridization.

28a. E. lanata Rose ssp. lanata.

28b. E. Lanata Rose ssp. occidentalis (Standley) Krukoff &

These shrubs or small trees are confined to western Mexico from sea level to 1540 m in drought-deciduous thorn forest.

36. E. chiapasana Krukoff. A very spiny small tree found at elevations up to 2100 m (characteristic tree of chaparral in Mexico).

70. E. oliviae Krukoff. Large tree found along the streams, dried in the dry season, in Oaxaca desert in Mexico.

85. E. decora Harms. A medium size tree native to "Hetero-land" in South West Africa.

102. E. velutina Willdenow. A large, spreading, short-bolled tree confined to the drier tropics (lowlands up to 1080 m) in West Indies and South America. Not as handsome as its very close relative E. grisebachii, but probably more drought-resistant.

103. E. grisebachii Urban. For information on this species, see a list of species especially handsome.

List of Erythrina ssp. Cultivated in California

Through the courtesy of Dr. Francis Ching, Director, County of Los Angeles Arboreta and Botanic Gardens, I received a shipment of specimens of Erythrina. Practically all of these were collected by Carlos D. Jativa. They are unusually well prepared and unusually well named.

I am publishing this list with pertinent information, that is the exact location of each tree, the season when it is in flower, etc. We contemplate eventually doing genetic work on Erythrina and this information will be useful to the person who carries on this work. This is obviously only the beginning and the list is not complete. It is most satisfactory that already 13 species and one hybrid are on this first list.

2. Erythrina crista-galli L.

N. Floy Bracelin 1406 (6/12/42 - flrs.), Garden of Anson & Anita Blake, Berkeley, California; Univ. Southern California Herbarium 15571 (7/16/32 - flrs.), Dr. vonKlein Smidt's garden in Chester Pl., Los Angeles; Miss Crow 32 (11/11/28 - flrs.), Glencoe Heights, Foothills N. of Glendora, So. California.

3. Erythrina falcata Benth

Carlos D. Jativa 3196 (4/1/77 - flrs.), tree +35 ft high, Whittier (6323 Greenleaf Ave.), Los Angeles County, 3199 (4/5/77 - flrs.), nearly evergreen tree +45 ft high, Los Angeles State & County Arboretum Arcadia, (IASCA Ac. 55-S-1420, location G-1), 3200 (4/5/77 - flrs.), nearly evergreen tree +30 ft high, Los Angeles State & County Arboretum, Arcadia, (IASCA Ac. 56-S-692, location H-6), 3209 (4/19/77), specimen is sterile and identification is not certain, San Diego Zoo, sapling +12 ft high, San Diego.

25. Erythrina coralloides A.DC.

Carlos D. Jativa 3187 (2/28/77 - flrs.), sapling to 9 ft tall, nearly leafless, IASCA Ac. 71-S-503, location P-14-NW).

36. Erythrina chiapasana Krukoff

Carlos D. Jativa 3211 (6/9/77 - flrs.), container-grown shrub +4 ft high, mature lvs. absent at anthesis but new lvs. just emerging.

40. Erythrina tajumulcensis Krukoff & Barneby

Carlos D. Jativa 3207 (4/19/77 - flrs.), deciduous tree +12 ft high, San Diego Zoo (E-7 by road across from Snake House) San Diego, 3192 specimen is sterile and identification is not certain.

42. Erythrina macrophylla A.DC.

Carlos D. Jativa 3191 (3/20/77 - flrs.), nearly evergreen tree +16 ft high, South exit, Los Angeles Area Chamber of Commerce, 404 So. Bixel St., L.A., 3205 (4/19/77 - flrs.), well foliated tree +12 ft high, across from Snake House and Queen palms in E-7, San Diego Zoo, San Diego, California, 3206 (4/19/77 - flrs. & frt.), deciduous tree +15 ft high, across from Snake House in E-7, San Diego Zoo, San Diego, California.

high, MacArthur Park, Los Angeles, Los Angeles County.

HYBRIDS

7. E. X sykesii Barneby & Krukoff (E. lysistemom Hutchinson
X E. coralloides A.DC. (?))

Carlos D. Jativa 3203 (4/15/77 - flrs.), deciduous tree ±12 ft high, South Coast Botanic Garden, Palos Verdes Peninsula, Los Angeles County, Calif. (labeled as "Erythrina phlebocarpa").

Erythrina spp. cultivation in Australia

The following species from cultivated plants (not native to Australia) were seen by me in a loan from MEL:

1. E. fusca Loureiro
2. E. crista-galli L.
3. E. falcata Bentham
13. E. subumbrans (Hasskarl) Merrill
16. E. speciosa Andrews
- 22a. E. herbacea L. ssp. herbacea
53. E. berteroana Urban
56. E. salviiflora Krukoff & Barneby
- 64b. E. corallodendrum L. var. vicolor Krukoff
71. E. caffra Thunberg
72. E. lysistemom Hutchinson
73. E. humeana Sprengel
74. E. zeyheri Harvey
75. E. acanthocarpa E. Meyer
95. E. abyssinica Lamarck
96. E. variegata L.

HYBRIDS

1. E. x fusca Loureiro
7. E. x peoppigiana (Walpers) O. F. Cook

Thus it appears that at least 16 species and two hybrids are or were cultivated at some time in Australia.

PLANTS OF THE SANDWICH ISLANDS COLLECTED BY
JAMES MACRAE

HAWAIIAN PLANT STUDIES 77

Harold St. John

Bishop Museum, Honolulu, Hawaii, Box 6037, USA.

James Macrae was a Scottish horticulturist, plant collector, and botanist, but his origin and parentage are unknown. In 1823 he was on the staff of the Botanic Garden at St. Vincent, West Indies. From 1824-1826 he was botanist on H.M.S. Blonde, a frigate of 46 guns, under Capt. George Anson, Lord Byron. From 1827-1830 he was superintendent of the Ceylon Botanic Garden, and he died in Ceylon in June 1830.

The Blonde was detailed to carry to Honolulu the bodies of the young Hawaiian king and queen, Liholiho and Kamamalu. While on a visit to the Court of St. James, they had both contracted measles and died of it.

Among the crew were Andrew Bloxam, naturalist, and James Macrae, botanist. Bloxam's diary has been published, but in it there are but few and insignificant mentions of plants.

The Blonde sailed on Sept. 28, 1824 from Spithead, and her route is here stated briefly: Oct. 18-23, Madeira; Nov. 27-Dec. 18, Rio de Janeiro; Dec. 24-Jan. 1, 1825, Santa Catharina, Brasil; Feb. 4-March 5, Valparaiso, where several of the crew and passengers caught small pox and died of it; March 14-17, Callao; March 25-April 2, Galapagos Islands; May 3-July 18, Hawaiian Islands; Aug. 1, Starbuck Island; Aug. 8, Mauke Island of the Cook Islands; Sept. 4, passed Juan Fernandez; Sept. 6, Valparaiso; Sept. 29, Talcahuana (Concepcion), Chili; Oct. 13, Valparaiso; Dec. 5, Coquimbo, Chili; Dec. 29, doubled Cape Horn; Jan. 23-28, 1826, St. Helena; March 15, arrived at Spithead, after a voyage of 17 month, 15 days.

Macrae was an industrious plant collector. On May 13, 1825, with Bloxam, he tramped up Nuuanu Valley, Oahu to the Pali, descended to the Kaneohe lowland, and slept in a hut. On the 14th

they returned by the same route. He collected plants and recorded some others.

May 17. He went by boat to Pearl River, and on the 18th returned overland via Moanalua Hill where he noted Argemone and Portulaca.

May 19. He botanized on Tantalus, and found 12 kinds of ferns.

May 21. He climbed Diamond Hill where he noted little but dry grass.

May 24. He explored Manoa Valley.

May 26. He explored Palolo Valley.

June 12. He arrived at Hilo, Hawaii.

June 15. With purser Wilson, Lt. Talbot, the missionary Mr. Goodrich, and 11 natives, they voyaged by canoe 30 miles to Laupahoehoe. In the afternoon with 6 natives as porters, they started inland to climb Mt. Kaah (Mauna Kea), and at 4 P. M. stopped at a hut near the lower border of the woods.

June 16. They ascended by a path through the woods, under lofty Acacia, and noted Metrosideros, Besteria (in error for Besleria, now our Cyrtandra), may Psychotrias, and 25-foot tree ferns, raspberries, and strawberries. After an estimated 18 miles they emerged from the woods and camped.

June 17. Temperature 52 degrees. They arose at 2 A. M., started at 3. After 3 miles tramping over pulverized lava, they found a "plant of the Syngenesia tribe, in growth much like a Yucca, with sharp pointed silver coloured leaves and green upright spike of three or four feet producing pendulous branches with brown flowers, truly superb, and almost worth the journey of coming here to see it on purpose." (This was evidently the silversword, Argyroxiphium sandwicense). Here Messrs Talbot and Wilson played out, and were left behind. Macrae and the native, Mantle, pushed on. At 12.30 they reached the snow line, and by 1 P.M. the summit. After 2, feeling unwell from mountain sickness, they descended to the hut. Macrae calculated the summit as at not less than 18,000 feet altitude.

June 18. They continued their descent. June 19. At 3 P. M. they reached Laupahoehoe, to find that the natives with the canoe had not waited for them.

Hence, they started for Hilo on foot, and after 10 miles journey made camp.

June 20. Their route crossed deep ravines, and forded swift streams, in one of which Mr. Talbot was washed down and nearly drowned. At 5 P. M. they reached Hilo.

June 23. He went 9 miles east into Puna, with little success.

June 25. Macrae, Talbot, Wilson, a guide, and natives started for Kilauea, marching 20 miles. He found quantities of three sorts of cranberries (presumably Vaccinium reticulatum, etc.).

June 26. Wet and foggy, so they did not start until 8 A. M. Traveled 18 miles.

June 27. At 8 A. M. they reached Kilauea, and descended the rim of the crater (Halemaumau) and went close to the erupting pillars. For the night they returned to the last camp.

June 28. They reached the first night's hut at 8 P. M., and the next day returned to Hilo.

July 2. Macrae visited Rainbow Falls and gathered specimens, one a "beautiful climbing plant, resembling an Erythrina" (which was evidently Strongylodon ruber).

July 7. The ship sailed northward.

July 9-13. At Honolulu.

July 14. Landed at Karakaakua (=Kealakekua), Hawaii.

July 15. Macrae had a few hours in the nearby lowlands.

July 16. Trip to Honaunau by canoe, but return overland, "over uneven masses of lava, and meeting with only a few plants such as tufts of low-growing euphorbias, convolvuluses, sidas, etc."

July 18. The Blonde sailed towards Otahite.

Macrae's Hawaiian collections total at least 184 species and varieties of vascular plants. They are preserved in the British Museum of Natural History, London. He did not publish anything concerning them. However, his manuscript diary was preserved, and the part dealing with the Sandwich Islands was printed (Wilson, 1922). In it is a good account of his collecting trips, and it has numerous mentions of the plants collected and observed.

List of Macrae's Hawaiian Plants

Pteridophyta

Lycopodiaceae

Lycopodium cernuum L. Woahoo, Maio, 1825.

" *phyllanthum* H. & A., Woahoo, Maio.

" *polytrichoides* Kaulf., Owhyhee, ad montem
ignivomen, Junio.

Selaginellaceae

Selaginella arbuscula (Kaulf.) Spring, Kaah, Junio.

" " Owhyhee, Volcano.

Psilotaceae

Psilotum complanatum Sw., Woahoo, Maio.

" *nudum* (L.) Griseb. Owhyhee, ad montem
ignivomen, Junio.

Botrychiaceae

Botrychium subbifoliatum Brack., Woahoo, Maio.

Ophioglossaceae

Ophioglossum falcatum (Presl) Fowler, Woahoo, Maio.

Marattiaceae

Marattia Douglasii (Presl) Baker, Sandwich Is.

Gleicheniaceae

Dicranopteris emarginata (Brack.) W. J. Robins.

Volcano, Oahu.

" " Woahoo, Maio.

" " Owhyhee, ad montem ignivomen.

Hicriopteris pinnata (G. Kunze) Ching, Owhyhee,
ad sinum Byron.

Sticherus owhyhensis (Hook.) Ching, Sandwich Is.

" " Owhyhee, ad montem Kaah, Junio.

Grammitidaceae

Adenophorus pinnatifidus Gaud., Woahoo, Maio.

" " Owhyhee, ad sinum Byron, Julio.

" *tamariscinus* (Kaulf.) Hook. & Grev.

Woahoo, Maio.

Gramitis tenella Kaulf. Woahoo, Maio.

Polypodiaceae

Pleopeltis Thunbergiana Kaulf. Oahu.

Microsorium spectrum (Kaulf.) Copel. Woahoo, Maio.

Phymatodes Scolopendria (Burm.) Ching, Owhyhee,
ad montem Kaah, Junio.

Polypodium pellucidum Kaulf. Owhyhee, ad montem
Kaah, Junio.

Sinopteridaceae

Doryopteris decipiens (Hook.) J. Sm., Owhyhee,
ad montem ignivomen, Junio.

Pellaea ternifolia (Cav.) Link, Owhyhee, ad
montem Kaah, Junio.

Pteridaceae

Pteris cretica L., Owhyhee, ad montem Kaah, Junio.

" *excelsa* Gaud., Woahoo, Maio.

" *irregularis* Kaulf., Woahoo, Maio.

Hemionitidaceae

Coniogramme pilosa (Brack.) Hieron., ad montem
Kaah, Junio.

Vittariaceae

Vittaria rigida Kaulf., Owhyhee, ad montem
ignivomen, Junio.

Hymenophyllaceae

Callistopteris Baldwinii (Eaton) Copel., Woahoo,
Maio.

" " *Owhyhee*, ad sinum Byron, Julio.

Mecodium recurvum (Gaud.) Copel., Owhyhee, ad
sinum Byron, Julio.

Spaheroscionium lanceolatum (H. & A.) Copel.,
Woahoo, Maio.

" *obtusum* (H. & A.) Copel., Woahoo,
Maio.

Vandenboschia davallioides (Gaud.) Copel., Woahoo,
Maio.

Dicksoniaceae

Cibotium Chamissoi Kaulf., Sandwich Is.

Dennstaedtiaceae

Microlepia setosa (Sm.) Alston, Woahoo, Maio.

Hypolepidaceae

Pteridium aquilinum (L.) Kuhn, var. *decompositum*
(Gaud.) Tryon, Owhyhee, ad montem ignivomen,
Junio, no. 17.

Lindsaeaceae

Sphenomeris chinensis (L.) Maxon, Woahoo, Maio.

Thelypteridaceae

Christella cyatheoides (Kaulf.) Holttum,
Ind. Sandwich, Maio.

Pneumatopteris stegnogrammoides (Brack) Holttum,
Woahoo, Maio.

Thelypteris hawaiiensis (Hbd.) Reed, Owhyhee, ad
montem Kaah, Junio.

" *hudsoniana* (Brack.) Reed, Owhyhee, ad
montem ignivomen, Junio, no. 3.

" *interrupta* (Willd.) Iwatsuki, Owhyhee,
ad montem ignivomen, Junio.

Aspleniaceae

Asplenium acuminatum H. & A., Woahoo, Maio.

" *Adiantum-nigrum* L., Owhyhee, ad montem
Kaah, Junio, no. 5.

" *contiguum* Kaulf., Owhyhee, ad montem
ignivomen, Junio.

" *densum* Brack., Mowee, Maio.

" " *Mouna Keah*, 1825.

" *enatum* Brack, no. 16, Sandwich Is.

" *Kaulfusii* Schlecht, Owhyhee, ad montem
Kaah, Junio.

" *nidus* L., Owhyhee, ad montem ignivomen,
Junio

" *pavonicum* Brack., Owhyhee, ad montem
Kaah, Junio.

" *schizophyllum* C. Chr., Owhyhee, ad montem
Kaah, Junio.

Athyriaceae

Athyrium Macraei (Hook. & Grev.) Copel., Owhyhee,
ad sinum Byron, Julio.

" *microphyllum* (Sm.) Alston, Woahoo, Maio.

" *Arnottii* (Brack.) Milde, Sandwich Is., 1825.

Aspidiaceae

Dryopteris rubiformis W. J. Robins., 1837.

Polystichum haleakalense Brack., Owhyhee, ad montem
Kaah, Junio.

Tectaria Gaudichaudii (Met.) Maxon, Owhyhee, ad
montem Kaah, Junio.

Elaphoglossaceae

Elaphoglossum hirtum (Sw.) C. Chr., var. *micans*
(Met.) C. Chr., Owhyhee, ad montem Kaah,
Junio.

" *pellucidum* Gaud., Owhyhee, ad
montem Kaah, Junio.

Nephrolepidaceae

Nephrolepis exaltata (L.) Schott, Woahoo, Maio.

Phanerogamae

Monocotyledones

Gramineae

Chrysopogon aciculatus (Retz.) Trin., Woahoo, Maio.

Heteropogon contortus (L.) Beauv. ex R. & S. Mowee.

Isachne distichophylla Munro ex Hbd., Owhyhee, ad
montem ignivomen, Junio.

Trisetum glomeratum (Kunth) Trin. in Steud.,
Owhyhee, ad montem Kaah, Junio.

Cyperaceae

Cyperus javanicus Houtt., Mowee, Maio.

" *phleoides* (Nees ex Steud) Mann, Owhyhee, ad
montem Kaah, Junio.

" *polystachyos* Rottb., Woahoo, Maio.

" *trachysanthos* H. & A., Owhyhee, ad sinum
Byron, Julio.

Fimbristylis pycnocephala Hbd., Mowee, Maio.

Liliaceae

Astelia Menziesiana Sm., Owhyhee, ad montem Kaah,
Junio.

Cordyline terminalis (L.) Kunth, var. *Ti* (Schott)
J. G. Baker, Woahoo, Maio.

Dianella sandwicensis H. & A., Woahoo, Maio.

Smilax sandwicensis Kunth, Woahoo, Maio.

Zingiberaceae

Zingiber Zerumbet (L.) Roscoe in Sm., Owhyhee, ad
sinum Byron, Julio.

Taccaceae

Tacca Leontopetaloides (L.) Ktze., Owhyhee, ad
sinum Byron, Julio.

Dicotyledones

Piperaceae

Peperomia latifolia Miq., Woahoo, Maio.

" *Macraeana* C. DC., Owhyhee, m. Kaah, Junio.

" *membranaceae* H. & A., Woahoo, Maio.

" *sandwicensis* Miq., Woahoo, Maio.

" *tetraphylla* (Forst. f.) H. & A., var.
parvifolia (C. DC.) Deg. & Deg.,
Woahoo, Maio.

Piper methysticum Forst. f., Sandwich Is.

Moraceae

Broussonetia papyrifera (L.) Vent., Woahoo, Maio.

" " Owhyhee, ad sinum Byron, Julio.

Urticaceae

Hesperocnide sandwicensis Wedd., Owhyhee, ad montem
Kaah, Junio.

Neradudia melastomiaefolia Gaud., var. parvifolia
(Wawra) Hbd., Woahoo, Maio.

Pilea peploides (Gaud.) H. & A., Woahoo, Maio.

Pipturus albidus (H. & A) Gray, Woahoo, Maio.

" Gaudichaudianus Wedd., Owhyhee, ad sinum
Byron, Julio.

Touchardia latifolia Gaud., no. 2, Owhyhee, ad
sinum Byron, Julio.

Loranthaceae

Korthalsella complanata (v.Tiegh.) Engler, Woahoo,
Maio.

Santalaceae

Santalum ellipticum Gaud., Woahoo, Maio.

" paniculatum H. & A., Owhyhee, ad montem
ignivomen, Junio.

" " Owhyhee, ad montem Kaah, Junio.

Polygonaceae

Rumex giganteus Ait. f., Owhyhee, ad montem Kaah,
Junio.

Chenopodiaceae

Chenopodium oahuense (Meyen) Aellen, Woahoo, Maio.

" " Owhyhee, ad montem Kaah, Junio.

Nyctaginaceae

Boerhavia diffusa L., Woahoo, Maio.

" " Mowee, Maio.

Pisonia (fragmentary, perhaps P. umbellifera).

Phytolaccaceae

Phytolacca sandwicensis Endl., Woahoo, Maio.

Portulacaceae

Portulaca oleracea L., Woahoo, Maio.

Ranunculaceae

Ranunculus hawaiiensis Gray, Sandwich Isl., 1825.

Capparaceae

Cleome sandwicensis Gray, Mowee, Maio.

Cruciferae

Lepidium o-waihiense C. & S., Woahoo, Diamond Hill,
21 May, 1825.

Saxifragaceae

Broussaisia arguta Gaud., f. arguta, Woahoo, Maio.

Pittosporaceae

Pittosporum confertiflorum Gray, Owhyhee, ad montem
Kaah, Junio.

Rosaceae

- Fragaria chiloensis* (L.) Duch., var. *sandwicensis*
Deg. & Deg., Owhyhee, ad montem ignivomen, Junio.
Osteomeles anthyllidifolia Lindl., Woahoo, Maio.
Rubus Macraei Gray, Owhyhee, ad montem Kaah, Junio.

Leguminosae

- Acacia Koa* Gray, var. *hawaiiensis* Rock, Owhyhee,
ad montem Kaah, Junio.
" *Koa* Gray, Woahoo, Maio.
Caesalpinia Bonduc (L.) Roxb., Woahoo, Maio.
Cassia Gaudichaudii H. & A., Woahoo, Maio.
Dioclea Wilsonii Standl., Owhyhee, ad sinum Byron,
Julio.
Sophora chrysophylla (Salisb.) Seem., subsp. & var.
chrysophylla, f. *obovata* Chock, Owhyhee, ad montem
Kaah, Junio.
Tephrosia purpurea (L.) Pers., Woahoo, Maio,
no. 53. Natives use to intoxicate fish.
Vigna marina (Burm.) Merr., Woahoo, Maio.

Zygophyllaceae

- Tribulus cistoides* L., Mowee, Maio.

Euphorbiaceae

- Aleurites moluccata* (L.) Willd., Woahoo, Maio, no. 17.
Euphorbia Degeneri Sherff, Woahoo, Maio.
Phyllanthus sandwicensis Muell.-Arg., Woahoo, Maio.

Sapindaceae

- Dodonaea viscosa* Jacq., forma *spatulata* (Sm.) Sherff,
Owhyhee, ad montem ignivomen, Junio.

Aquifoliaceae

- Ilex anomala* H. & A., Owhyhee, ad sinum Byron, Julio.

Celastraceae

- Perrottetia sandwicensis* Gray, Woahoo, Maio.

Elaeocarpaceae

- Elaeocarpus bifidus* H. & A., Woahoo, Maio.

Malvaceae

- Abutilon incanum* (Link) Sweet, Woahoo, Maio.
Hibiscus tiliaceus L. Woahoo, Maio.
Malva parviflora L., Mowee, Maio.
Thespesia populnea (L.) Soland. ex Correa, Owhyhee,
ad sinum Byron, Julio.

Sterculiaceae

- Waltheria indica* L. Mowee, Maio.

Theaceae

- Eurya sandwicensis* Gray, Woahoo, Maio.

Hydrophyllaceae

Nama sandwicensis Gray, Woahoo, Maio.

Boraginaceae

Heliotropium curassavicum L., Mowee, Maio.

Verbenaceae

Vitex ovata Thunb., Owhyhee, ad sinum Byron, Julio.

Solanaceae

Solanum sandwicense H. & A., Woahoo, Maio.

Scrophulariaceae

Bacopa Monnieria (L.) Wettst., Owhyhee, ad montem
Kaah, Junio.

Gesneriaceae

Cyrtandra cordifolia Gaud., Woahoo, Maio.

" *Lessoniana* Gaud., var. *Lessoniana*,
Woahoo, Maio.

" *Macraei* Gray, Woahoo, Maio.

" *paludosa* Gaud., var. *paludosa*,
Woahoo, Maio.

Myoporaceae

Myoporum sandwicense Gray, Owhyhee, ad montem
Kaah, Junio, no. 16.

Plantaginaceae

Plantago glabrifolia (Rock) Pilger, Owhyhee, ad
montem ignivomen, Junio.

" *princeps* C. & S., var. *elata* Wawra,
Woahoo, Maio.

Rubiaceae

Coprosma ernodeoides Gray, var. *ernodeoides*,
Owhyhee, ad montem ignivomen, Junio.

" *foliosa* Gray, Woahoo, Maio.

" *Menziesii* Gray, Owhyhee, ad montem
ignivomen, Junio.

" *pubens* Gray, var. *pubens*, Owhyhee, ad
Montem Kaah, Junio.

Gouldia terminalis (H. & A.) Hbd., var.

Woahoo, Maio.

Hedyotis Mannii Fosb., var. *scaposa* Fosb.,
Owhyhee, ad sinum Byron, Junio.

Psychotria kaduana (C. & S.) Fosb., Woahoo,
Maio, no. 72.

" *Mariniana* (C. & S.) Fosb.,
Woahoo, Maio.

" sp. Owhyhee, Byron's Bay, Julio.

Morinda citrifolia L. Woahoo, Maio:

" " Owhyhee, Byron's Bay.

Cucurbitaceae

Sicyos microcarpus Mann, subsp. *laysanensis* (St. John)
St. John, var. *ewaensis* St. John, Woahoo, Maio.

Goodeniaceae

Scaevola Taccada (Gaertn.) Roxb., var. *sericea*
(Vahl) St. John, Owhyhee, ad sinum Byron, Julio.

Compositae

Argyroxiphium sandwicense DC., Owhyhee, ad montem
Kaah, Junio.

Aster sandwicensis (Gray) Hieron., Woahoo, Maio.

Bidens sandwicensis Less., Woahoo, Maio.

Erigeron canadensis L., Woahoo, Maio.

Plants Mentioned in Macrae's Journal, but not Collected

Pandanaceae

Pandanus, Owhyhee, Laupahoehoe, p. 48.

Palmae

Coconut, Owhyhee, Hilo, p. 46; Kealakekua, p. 72, etc.

Araceae

Taro, Owhyhee, Kealakekua, p. 71; etc.

Musaceae

Banana, Owhyhee, Hilo, p. 46; Laupahoehoe, p. 49;
Laupahoehoe to Hilo, p. 59; Kealakekua, p. 71;
Woahoo, Palolo, p. 36.

Zingiberaceae

Ginger, Woahoo, Manoa, p. 35.

Turmeric, Woahoo, Manoa, p. 35.

Cannaceae

Canna, Woahoo, Manoa, p. 35, one specimen wild
among the grass.

Piperaceae

Awa, Woahoo, Manoa, p. 35.

Moraceae

Breadfruit, Owhyhee, south to Hilo, p. 59;
Kealakekua, p. 71.

Santalaceae

Santalum Freycinetianum, Sanderswood, Woahoo,
Palolo, one middle sized tree, p. 36.

Portulacaceae

Portulaca, Woahoo, Moanalua.

Papaveraceae

Argemone, Woahoo, Moanalua, p. 30.

Leguminosae

(*Strongylodon ruber*), Owhyhee, Rainbow Falls,
"vine like *Erythrina*," p. 66.

Euphorbiaceae

Euphorbia, low growing, Owhyhee, Honaunau, p. 72.

Anacardiaceae

Rhus, Owhyhee, montem Kaah, p. 49.

Malvaceae

Hibiscus, Woahoo, Nuuanu, p. 23.

Sida, Owhyhee, Honaunau, p. 72.

Convolvulaceae

Sweet potato, Owhyhee, Kealakekua, p. 71.

Convolvulus, Woahoo, Nuuanu, p. 23; Owhyhee,
Honaunua, p. 72.

Solanaceae

Tobacco, Owhyhee, Kealakekua, p. 71.

Gesneriaceae

Besteria, for *Besleria* (= *Cyrtandra*), Owhyhee,
montem Kaah, p. 51.

Cucurbitaceae

Gourd calabsh, Owhyhee, south to Hilo, p. 59.

Watermelon, Woahoo, Nuuanu, p. 24.

Lobeliaceae

Lobelia, 2-3 tall, Woahoo, Nuuanu, p. 25.

" many, Owhyhee, montem Kaah, p. 51.

Literature Cited

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Sandwich Islands in 1825, being extracts from
the MS diary of James Macrae, Scottish botanist,
1-75, 11 figs.

Bloxam, Andrew, 1925. Diary of Andrew Bloxam,
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to the Hawaiian Islands 1824-25. B. P. Bishop
Mus., Spec. Publ. 10: 1-96, 9 pl, 7 figs,
portrait.

CERTAMEN MELASTOMATACEIS XXVIII.

John J. Wurdack

U. S. National Herbarium, Smithsonian Institution

These notes center on aequatorial bookkeeping in Miconia Sect. Cremanium, but the collections of Meriania by Kirkbride, which ruined an already prepared species key, have necessarily been included. To facilitate completion of the floristic treatment, a short moratorium on further collecting of Ecuadorian melastomes seems much to be desired.

MERIANIA AMPLEXICAULIS Wurdack, sp. nov.

M. acostae Wurdack in floribus distanter affinis, foliis essentialiter sessilibus amplexicaulibus differt.

Ramuli obtuse quadrangulati sicut foliorum subtus venae primariae inflorescentiaque pilis pinoideis ca. 0.2-0.4 mm longis dense induti. Folia essentialiter sessilia (petiolis ca. 3 mm longis); lamina 14-20 X 5.5-9.5 cm elliptica vel oblongo-elliptica apice gradatim per ca. 1-2 cm hebeti-acuminato basi ca. 0.5-1 cm cordato-amplexicaulis, subrigida et obscure distanterque undulato-serrulata, supra glabra, subtus in superficie pilis stellatis (apice interdum setuloso-protracto) 0.2-0.3 mm diam. sparse induta, breviter (1-2 cm) 5-plinervata nervis secundariis ca. 5 mm inter se distantibus nervulis subtus planis obscuris areolis ca. 1 mm latis. Inflorescentia ca. 8 cm pedunculata, floribus ca. 15 subconfertis 5-meris; pedicelli 5-6 mm longi sicut hypanthium pilis pinoideis crassis 0.2-0.4 mm longis dense puberuli. Hypanthium (ad torum) 6.5 mm longum obscure 10-costatum; calycis tubus ca. 1-1.5 mm longus, lobis interioribus ca. 3-3.3 X 4.5-5.3 mm ovatis, dentibus exterioribus crassis ca. 0.8-1 mm eminentibus. Petala glabra 16-18 X 9.5-11 mm oblongo-ovata apice rotundato. Stamina paulo dimorphica glabra; filamenta 10-10.5 mm longa; antherarum thecae 7-8 X 1 X 1.2-1.4 mm oblongo-subulatae, poro ca. 0.3 mm diam. dorsaliter inclinato; connectivum ca. 0.3 mm prolongatum, dente dorsali ca. 1.5-2 mm longo hebeti paullulo (0.05-0.1 mm) 2-3-denticulato, appendice ascendenti hebeti ca. 0.5-1 mm libera. Stigma non expansum; stylus 19 X 1 mm glaber in ovarii apicem ca. 0.5 mm immersus; ovarium 5-loculare glabrum ca. 4 mm longum oblongum, apice hebeti-lobulato.

Type Collection: J. H. Kirkbride 4115 (holotype US 2827838; isotype Q), collected in cloud forest beside Río Chontas ca. 4 km south of Cosanga, Cantón Quijos, Prov. Napo, Ecuador, elev. 2100 m, 15 Feb. 1978. "Vine. Petals pink; anthers cream."

Meriania acostae has leaves with petioles 7-11 cm long and blades 23-30 cm wide, loose panicles with the flowers on pedicels 15-21 mm long, and somewhat larger petals and stamens. Meriania boliviensis Cogn. has similar connective appendages, but leaves

with petioles 2-4 cm long and blades acute to rounded at the base, lower inflorescences, and calyx teeth projecting 5-7 mm.

MERIANIA KIRKBRIDEI Wurdack, sp. nov.

M. weberbaueri Macbride in foliorum subtus pubescentia staminibusque similis, floribus maioribus calyce in alabastris clauso rostrato demum supra torum irregulariter dehiscenti differt.

Ramuli obtuse sulcato-quadrangulati sicut laminarum subtus venae primariae petiolique pilis barbellatis usque ad ca. 0.3 mm longis plus minusve deciduis sensiuscule insuti. Petioli (3-) 5-8 cm longi; lamina 16-25 X 12-17 cm ovato-elliptica apice abrupte per 0.5-1 cm hebeti-acuminato basi late obtusa vel rotundato-truncata, firme membranacea et distanter undulato-serrulata (serratulis hebetibus ca. 0.5 mm altis), supra primum pilis barbellatis usque ad 1 mm longis et pilis pinoideis ca. 0.2 mm longis induta mox glabrata, subtus in venulis superficiei-eque pilis pinoideis 0.2-0.4 mm longis sparsiuscule setulosa, breviter (0.5-1 cm) 7-plinervata vel 7-nervata nervis secundariis ca. 5 mm inter se distantibus sicut nervis tertiariis subtus paulo elevatis nervulis subtus planis obscuris areolis ca. 0.5 mm latis. Panicula 10-18 cm longa lataque, floribus 5-meris ca. 12-14, pedicellis 2-3 cm longis, bracteolis non visis. Hypanthium (ad torum) 7-8 mm longum teres extus sicut calyx dense pilis pinoideis 0.1-0.2 mm longis indutus; calyx in alabastris maturis clausus 15-16 mm longus ad apicem 2.5-3 mm rostratus ad anthesim irregulariter ca. 1-2 mm supra torum dehiscens. Petala glabra 4.5-5 X 4-4.5 cm obovata apice rotundato-truncata. Stamina paulo dimorphica glabra; filamenta 22-23 mm vel 17-19 mm longa; antherarum thecae 14 vel 13 X 2.5-3 X 2.5-3 mm subulatae declinatae poro 0.7-0.8 mm diam. dorsa-liter inclinato, dente basali 5.5-7 X 5 mm vel 10 X 1.5-2 mm breviter erosulo-denticulato vel acuto, appendice ascendenti non evoluta. Stigma non expansum; stylus 22 X 1.5 mm glaber; ovarium 5-loculare apice truncato circum stylum non protracto.

Type Collection: J. H. Kirkbride 4208 (holotype US 2827837; isotype Q), collected in a quebrada across the Río Cosanga from Cosanga, Cantón Quijos, Prov. Napo, Ecuador, elev. 1980 m, 19 Feb. 1978. "Tree to 10 m. Petals dark purple; anthers yellow and purple; stigma purple."

The suggested Peruvian relative has generally similar foliage with qualitatively the same pubescence (albeit with longer-protracted trichome tips), but much smaller flowers (hypanthium plus calyx in mature buds ca. 15 mm long; petals ca. 2 cm long), with the distinct external calyx teeth free in bud and the persistent interior lobes regular at anthesis. All the other species (including *M. tomentosa* (Cogn.) Wurdack) with calyces closed in bud have smaller flowers and different stamens (usually with ascending dorsal appendages) or petals. The Ecuadorian *M. acostae* Wurdack differs in the cordate leaf bases, somewhat smaller flowers, regularly dehiscing calyx, hypanthial hairs with protracted tips, and anther connectives with an

ascending appendage as well as the basal tooth.

MICONIA GLYPTOPHYLLA Wurdack, sp. nov.

Sect. Cremanium. *M. caelatae* (Bonpl.) DC. affinis, foliorum subtus trichomatibus maioribus floribus maioribus differt.

Ramuli primum obtuse quadrangulati demum teretes sicut petioli laminarum subtus venae primariae inflorescentiaeque pilis pinoideis usque ad 0.3 mm longis et pilis stellatis ca. 0.4 mm latis dense induti. Petioli 0.7-1.2 cm longi; lamina (5-)7-14 X 1.5-3.5 cm lanceato-oblonga apice breviter hebeti-acuminato basi acuta, rigida et integra, supra glabra et rugoso-bullata, subtus dense pilis simplicibus vel pauciramosis ca. 1 mm longis laxis setulosa, 3-nervata nervis secundariis ca. 2-3 mm inter se distantibus nervis tertiariis subtus elevato-reticulatis nervulis subtus planis obscuris areolis ca. 0.5-0.7 mm latis. Panicula 6-9 cm longa multiflora; flores 5-meri aggregati essentialiter sessiles, bracteolis 1.8-3 X 0.6-1 mm usque ad anthesim persistentibus. Hypanthium (ad torum) 1.9 mm longum modice stellato-puberulum; calycis tubus 0.1 mm longus, lobis interioribus 0.4-0.5 mm altis ovatis obtusis, dentibus exterioribus inframarginalibus; torus intus glaber. Petala obscure granulosa 1.3-1.4 X 1 mm obovata. Stamina in dimensionibus paullulo dimorphica glabra; filamenta 2.2-2.9 mm longa; antherarum thecae 1.6-1.9 vel 1.5-1.8 X 0.4-0.5 X 0.5 mm oblongae apice 0.3 mm biporoso; connectivum non prolongatum ad basim trilobulatum. Stigma clavato-expansum 0.5-0.6 mm diam.; stylus 3.1-3.5 X 0.3-0.5 mm glaber in ovarii collo 0.3 mm immersus; ovarium 2-loculare et 1/4 inferum, apice conico costulato sparsissime glandulis 0.05-0.1 mm longis coronato.

Type Collection: W. H. Camp E-4566 (holotype US 2167419; isotypes NY, S), collected 1-8 km north of Sevilla de Oro, Prov. Azuay, Ecuador, elev. 2400-2700 m, 27 July-12 August 1945.

"Retoño of E-4565 after clearing, sprouts to 2 m. Leaves deep green, subnitid above, pale brown-pubescent below. Calyx lobes tipped with red. Corolla pale yellow; filaments and anthers cream-yellow."

Paratypes (all topotypical): Camp E-4565 (F, K, NY, S, US). "Tree 5 m. Leaves coriaceous, deep green and subnitid above, dark brown-pubescent below. Hypanthium pale green under brownish scurf. Corolla white with yellow tinge; filaments and anthers dull yellowish white. Fruit small, white"; Camp E-4611 (NY). "Shrubby tree 2 m. Leaves deep green, nitid above; dark brown-pubescent below. Corolla and stamens creamy white"; Camp E-4368 (NY).

The lower leaf surface pubescence in *M. caelata* is completely of stellulate-pinoid hairs only 0.2-0.3 mm long and the flowers are small (hypanthium ca. 1.5 mm long; petals 1 mm long). The distinctness of the material of *M. glyptophylla* had already been noted (Phytologia 23: 489. 1972).

MICONIA VILLONACENSIS Wurdack, sp. nov.

Sect. Cremanium. *M. medusae* Gleason affinis, ramulorum

foliorumque pubescentia breviora foliorum ciliis marginalibus brevioribus venulorum areolis crebris floribus maioribus differt.

Ramuli primum obtuse quadrangulati demum teretes sicut petioli inflorescentiaque pilis pinoideis plus minusve deciduis 0.1-0.2 mm longis modice vel sparse induti. Petioli 1-1.5(-2) cm longi; lamina plerumque 4-7 X 1.5-3 cm elliptico-lanceata apice hebeti-acuto vel paullulo hebeti-acuminato basi late acuta vel anguste obtusa, subcoriacea et calloso-serrulata ciliis ca. 0.1-0.2 mm longis, supra glabra, subtus in superficie pilis stipitato-dendroideis (stipite 0.1-0.3 mm longo) plus minusve deciduis sparsiuscule vel sparse setulosa, 3-nervata nervis secundariis ca. 2 mm inter se distantibus nervulis subtus planis areolis 0.5-0.7 mm latis. Panicula 5-7 cm longa multiflora; flores 5-meri, pedicellis 0.3-0.5 mm longis, bracteolis 1-1.3 X 0.1-0.2 mm caducis. Hypanthium (ad torum) 1.9-2 mm longum essentialiter glabrum; calycis tubus 0.1-0.15 mm longus, lobis interioribus 0.6-0.7 mm longis hebetibus, dentibus exterioribus inframarginalibus. Petala 1.2-1.3 X 1.2-1.3 mm late obovata glabra. Stamina paullulo dimorphica glabra; filamenta 2-2.1 mm longa; antherarum thecae 1-1.3 X 0.4 X 0.45-0.5 mm late oblongae et late biporosae; connectivum ad basim ventraliter inconspicue (0.1 mm) bilobulato-prolongatum dorsaliter vix (0.05 mm) calcaratum. Stigma paulo expansum 0.5 mm diam.; stylus 2.6 X 0.25-0.35 mm glaber in ovarii apicem ca. 0.3 mm immersus; ovarium biloculare et ca. 1/2 inferum cono 0.8 mm alto 5-costulato glabro.

Type Collection: G. Harling & L. Andersson 13845 (holotype GB; isotype US), collected on summit and upper slopes of Cerro Villonaco west of Loja, Prov. Loja, Ecuador, elev. 2600-2750 m, 12 April 1974. "Shrub ca. 3/4 m high. Corolla white."

Paratypes (topotypical): W. H. Camp E-226 (NY), elev. 2400-2900 m ("Shrubby or sometimes a tree to 4 m. Corolla and stamens white"); B. Sparre 16234 (S), elev. 2500 m.

The trichomes of M. medusa on the leaves beneath have a stalk 0.5-1 mm long, the marginal leaf cilia are ca. 0.5 mm long, the leaf venule areoles 1-1.5 mm wide, the hypanthium 1 mm long, and the anther thecae only 0.6-0.7 mm long. Although I had previously identified Camp E-226 as possibly M. loxensis (Bonpl.) DC., I have since examined the Bonpland type collection and do not believe that M. villonacensis is really closely related.

MICONIA COSANGENSIS Wurdack, sp. nov.

Sect. Cremanium. M. jorgensenii Wurdack affinis, ramulorum foliorumque pubescentia breviora, foliorum laminis proportionaliter angustioribus stigmatibus minus expansis differt.

Ramuli primum obscure quadrangulati mox teretes sicut folia inflorescentia hypanthiaque modice vel sparse glandulis appressis ca. 0.05 mm latis induti alioqui glabri vel caduce squamulosi; ramulorum nodi paulo incrassati circum petiolorum bases infra paulo tumidi. Petioli 0.8-1.7 cm longi; lamina

4-6.3 X 2-3.5 cm elliptica apice breviter (0.2-0.5 cm) subgradatimque hebeti-acuminato basi late acuta vel obtusa, tenuiter coriacea et integra, obscure (0.2 mm) distanterque appresso-ciliolata, 3-nervata nervis secundariis ca. 2 mm inter se distantibus nervulis subtus planis areolis 0.3-0.5 mm latis. Panicula 7-10 cm longa multiflora; flores 5-meri, pedicellis ca. 1-1.3 mm longis, bracteolis 1-1.7 X 0.5-0.7 mm oblongis mox deciduis. Hypanthium (ad torum) 1.6-2 mm longum; calycis tubus 0.3 mm longus, lobis interioribus 0.4 mm longis oblatis, dentibus exterioribus appressis inframarginalibus. Petala 1.9-2.1 X 1.8-2 mm suborbicularia glabra. Stamina paullulo dimorphica glabra; filamenta 2.2-2.8 mm longa; antherarum thecae 0.8-1 X 0.3-0.4 X 0.35-0.5 mm ellipticae late biporosae; connectivum ad basim ventraliter 0.15-0.2 mm prolongatum vix bilobulatum dorsaliter dente hebeti 0.2-0.3 mm vel 0.15-0.2 mm armatum. Stigma paullulo clavato-expansum 0.5 mm diam.; stylus 3.8-4 X 0.3-0.4 mm glaber in ovarii apicem paulo (0.2 mm) intrusus; ovarium 3-loculare et ca. 2/3 inferum, apice conico 0.3-0.5 mm alto glabro vel sparsissime glanduloso.

Type Collection: E. Asplund 9564 (holotype S), collected at Cosanga, Prov. Napo, Ecuador, elev. 1900 m, 27 Oct. 1939. "Small shrub. Flowers white."

Paratypes (Prov. Napo, Ecuador): P. J. M. Maas, C. C. Berg, & B. ter Welle 2977 (U), from very wet forest at Cosanga, elev. 1850 m, 20 Sep. 1977. "Inflorescence, ovary, and calyx greenish; corolla and stamens white"; J. H. Kirkbride 4160 (Q, US), from degraded cloud forest in potrero 3.5 years old, 2.5 km north of Cosanga, elev. 2150 m, 18 Feb. 1978. "Shrub to 3 m; flowers white."

Miconia jorgensenii has leaf blades with length/width ratio 1.3-1.5 (rather than 1.8-2), caducous dendritic hairs 0.2-0.3 mm long on the branchlets, leaf veins beneath, and inflorescence, and stigmas ca. 0.7 mm diam. Miconia cremophylla Naud. has larger leaves with much laxer venule reticulation, as well as essentially sessile flowers with more expanded stigmas.

MICONIA MEDIOCRIS Wurdack, sp. nov.

Sect. Cremanium. M. cosangensi Wurdack affinis, foliis eciliatis venulorum areolis latioribus floribus paullulo minoribus differt.

Ramuli paulo nodosi primum obscure quadrangulati mox teretes sicut foliorum subtus venae primariae inflorescentiaeque primum plerumque pilis pinoideis ca. 0.1 mm longis sparse induti glabrati. Petioli 0.5-1 cm longi; lamina 5-8(-10) X 2-3(-4.5) cm oblongo-elliptica apice hebeti-acuto basi acuta, subcoriacea et integra, eciliata, supra glabra, subtus in superficie glandulis minutis sparsis exceptis glabra, 3-nervata nervis secundariis 1-2 mm inter se distantibus nervulis subtus obscure elevatis areolis 0.7-1 mm latis. Panicula plerumque 7-11 cm longa multiflora; flores 5-meri, pedicellis 0.5-1 mm longis, bracteolis ca. 1-2.2 mm longis angustis caducis. Hypanthium (ad torum) 1.7-1.9 mm longum glandulis minutis sparsis exceptis glabrum; calycis

tubus 0.1-0.15 mm longus, lobis interioribus 0.7-0.4 mm longis obtusis remotis, dentibus exterioribus inframarginalibus. Petala obscure granulosa 1.2-1.6 X 1.1-1.5 mm suborbicularia vel obovato-suborbicularia. Stamina paullulo dimorphica glabra; filamenta 2.1-2.9 mm longa; antherarum thecae 0.8-1.1 X 0.3-0.4 X 0.35-0.45 mm oblongae vel obovato-oblongae late bigrosae; connectivum ad basim ventraliter paulo (0.1-0.15 mm) bilobulato-prolongatum dorsaliter lente lobati 0.1-0.25 mm longo armatum. Stigma paulo expansum 0.3-0.4 (-0.5) mm diam.; stylus 2.5-4 X 0.1-0.3 mm glaber in ovarii apicem ca. 0.2 mm immersus; ovarium 3-loculare et 1/2 inferum, cono 0.4-0.6 mm alto glabro.

Type Collection: W. H. Camp E-709 (holotype NY; isotype US), collected on the eastern cordillera along the Sevilla de Oro-Mendez trail, Páramo del Castillo, Prov. Azuay-Morona-Santiago border, Ecuador, elev. 2700-3300 m, 30 Oct. 1944. "Shrub 4 m. Corolla and stamens white."

Paratypes (both from the Sevilla de Oro-Mendez trail, Morona-Santiago, Ecuador): Camp E-4361 (NY), from near the junction of the Rios Pailas and Negro, elev. 1800-2300 m.

"Tree 4 m. Leaves deep green, dull above; yellow-green, subnitid below. Hypanthia pale yellowish; calycine teeth tipped with nigrescent magenta. Petals white; filaments white; anthers cream-white"; Camp E-500 (NY), from between Hda. Chontal and Sta. Elena, elev. 1000-1400 m. "Shrub 6 m. Corolla and stamens white."

Miconia cosangensis has only glands on the stems and leaves, callose-ciliate leaf blades, and somewhat larger petals. Miconia cremophylla Naud. resembles M. mediocris in foliar venulation, but has leaf blades callose-ciliate, more prominent callose-ringed petiole insertions on the branchlets, and essentially sessile flowers with slightly larger anthers and stigmas. Camp E-300 shows less vegetative pubescence and slightly larger flowers than the other two collections of M. mediocris; all had been distributed as M. theaezans (Bonpl.) Cogn.

MICONIA LIGUSTRINA (Smith) Triana var. SETULINODIS Wurdack, var. nov.

Ramulorum nodis et interdum ramulis novellis inflorescentiae axe et ramis foliorum subtus basim versus venis primariis sparse setulosis differt.

Type Collection: L. Holm-Nielsen & S. Jeppesen 1388 (holotype AAU; isotype US), collected in lower páramo near timber line, Pilalo-Latacunga road, Prov. Cotopaxi, Ecuador, elev. 3400 m, 6/7/1968. "Bush 2.5 m, crooked. Flowers white."

Paratypes (all Pichincha, Ecuador): A. Sodiro 1 (BR), from "M. Mojanda," elev. 3300 m; R. Benoist 4327 (P, US), from Tablahuasi; Sodiro 501 (BR), from Pichincha, elev. 3600 m; Jameson 732 (BM, BR, K), from western side of Pichincha, elev. 3600 m.

The typical variety, completely without setulae, is known with geographical sureness in Ecuador from most of the eastern

Cordillera, with less certainty from Pichincha (Jameson 169). Certainly there are problems, at least in leaf shape, with material from Carchi which is being referred by me to M. tinifolia Naud.; otherwise M. ligustrina in Ecuador resembles typical collections from Colombia in the small blunt leaves with well-developed pocules beneath between the costa and lateral primary veins. The setulose variety somewhat resembles M. castillensis Wurdack and M. onaensis Wurdack, both of which have shorter dorsal connective appendages, more expanded stigmas, and completely inferior ovaries. Miconia nodosa Cogn., known only from Nariño and Putumayo, Colombia, certainly is like M. ligustrina and the typical form of M. tinifolia in floral features, differing from both in the sparse pinoid pubescence on the leaf surfaces beneath (but showing setulose branchlet nodes and leaves without vein pocules).

MICONIA EGREGIA Wurdack, sp. nov.

Sect. Cremanium. M. hutchisonii Wurdack affinis, ramulis primum setulosus foliis distincte calloso-serrulatis antheris minoribus differt.

Ramuli primum quadrangulati demum teretes sicut folia inflorescentia hypanthiaque caduce squamulosi vel pinoideo-squamulosi et sicut inflorescentiae axis sparse vel modice setulosi pilis usque ad 0.8 mm longis paullulo asperis. Petioli 0.2-0.4 cm longi; lamina 1-1.7 X 0.5-0.9 cm elliptica apice hebeti-acuto basi acuta, coriacea et inconspicue calloso-serrulata, subtus in venae primariae axillis setulosa alioqui esetulosa, breviter (ca. 0.2 cm) pseudo-triplinervata nervulis subtus paulo evolutis planis areolis 0.5-1 mm latis. Panicula 2-3 cm longa, floribus ca. 10-14; flores 5(-6)-meri ad anthesim paulo nutantes, pedicellis 1-2 mm longis, bracteolis ca. 1.8 X 0.25 mm et ca. 0.5 mm infra hypanthium insertis ante anthesim deciduis. Hypanthium (ad torum) 2.6 mm longum; calycis tubus 0.5 mm longus, lobis interioribus 0.5 mm longis latisque rotundatis remotis eciliatis, dentibus exterioribus inframarginalibus. Petala glabra 3.3-3.4 X 3.4-3.5 mm obovato-suborbicularia apice retuso. Stamina paullulo dimorphica glabra; filamenta 2.7-2.8 mm longa; antherarum thecae 0.7-0.9 X 0.3 X 0.7-0.8 mm obovatae late (0.6-0.7 mm) biporae; connectivum ventraliter 0.5-0.6 mm bilobulato-prolongatum, dorsaliter dente 0.05-0.2 mm longo descendenti armatum. Stigma expansum 0.6 mm diam.; stylus 3.7 X 0.25-0.45 mm glaber; ovarium 3-loculare et omnino inferum, apice glabro.

Type Collection: C. Sandeman 4086 (holotype K), collected between La Colmena and Llama, Cutervo, Depto. Cajamarca, Peru, elev. 2700 m, July 1943. "Shrub with cream-coloured myrtle-like flowers and box-like rather coriaceous foliage. Full exposure."

Paratype: A. Weberbauer 4163 (BR), from Huambos, Prov. Chota, Depto. Cajamarca, Peru, elev. 3000-3100 m, May 1904.

Miconia hutchisonii was erroneously placed in Sect.

Amblyarrhena, but the anthers were actually semi-abortive; in the toptypical Rauh 35556 (US), well-developed anthers are 1.8 X 0.9-1 X 0.7 mm and broadly (0.6-0.7 mm) bipored, indicating the

proper placement of this species in Sect. Cremanium. Another Peruvian relative, M. emungia Macbride from Libertad, has larger leaves (petioles ca. 1 cm; blades mostly 2-3 X 1.9-2 mm) and flowers (petals 4 mm long; anthers ca. 1.5 mm long; stigma ca. 1.5 mm diam.), as well as a 5-celled ovary. The Ecuadorian M. castillensis Wurdack and M. onanensis Wurdack both have smaller petals than M. egregia, as well as larger leaves, anthers, and stigmas. While M. egregia was collected not far from the type locality of M. vaccinioides (Bonpl.) Naud., that 4-merous species differs also in the esetulose vegetative parts and broader stigma; I am dubious that the Piura collection (Weberbauer 6087, F) cited for this species is correctly identified (calyx lobes 0.7 mm long; filaments and style sparsely glandular-puberulous), but still have seen no recent topotypical material for comparison. Weberbauer 4163 was the basis for the erroneous report of M. buxifolia Naud. from Peru (Field Mus. Publ. Bot. 13, 4: 392. 1941); the true range of that species is in the Andes of northeastern Colombia and Venezuela. Of the 10 observable flowers in the collections of M. egregia, ten were 5-merous and six 6-merous.

MICONIA BARCLAYANA Wurdack, sp. nov.

Sect. Cremanium. M. prietoi Wurdack affinis, foliorum subtus venis secundariis distincte evolutis calycis lobis interioribus eciliatis antherarum appendice dorsali ascendenti differt.

Ramuli primum sulcato-quadrangulati demum teretes sicut folia subtus hypanthiaque glandulis minutis caducis sparse induti in nodis obscure graciliterque barbellati alioqui glabri. Petioli 0.3-0.6(-1) cm longi; lamina 0.7-1.5 X 0.5-1 cm late elliptica apice obtuso vel rotundato basi late acuta, coriacea et integra eciliata, trinervata nervis secundariis subtus gracilibus 1-2 mm inter se distantibus tertiariis subtus gracilibus planis laxe reticulatis (areolis ca. 1 mm latis). Flores 5-meri solitarii vel bini ut videtur laterales (ramulis crescentibus superantibus ?), pedicellis infra bracteolas 2-4 mm longis supra 1-1.5 mm, bracteolis ca. 4 X 1 mm oblanccatis persistentibus. Hypanthium (ad torum) 3.7-4 mm longum; calycis tubus 1 mm longus, lobis interioribus ca. 1.3 mm longis ovatis rotundatis eciliatis, dentibus exterioribus crassis lobos interiores aequantibus. Petala pruinosa 6-8 X 5.6-8 mm obovato-suborbicularia apice ca. 1 mm retuso. Stamina glabra in dimensionibus paulo dimorphica; filamenta 5.3 mm longa vel 4.5 mm longa; antherarum thecae oblongo-obovatae late biporosae poris paulo ventraliter inclinatibus. Stamina maiora: thecae 2.3-2.4 X 0.8 X 1 mm, connectivo ad basin ventraliter ca. 0.4 mm bilobulato-prolongato dorsaliter dente hebeti ascendenti 0.5-0.7 mm longo armato. Stamina minora: thecae 2 X 0.8 X 1 mm, connectivo ad basin ventraliter ca. 0.5 mm bilobulato-prolongato dorsaliter dente hebeti ascendenti 0.4-0.6 mm longo armato. Stigma non expansum 0.7 mm diam.; stylus ca. 7 mm longus glaber in ovarii apicem ca. 0.3 mm immersus; ovarium 3-loculare et 1/2 inferum, cono apicali 1-1.5 mm alto glabro.

Type Collection: Harriet G. Barclay & Pedro Juaquibioy 8936 (holotype US 2372994), collected near Chihuila Sacha (Ainchilibi) near the Cordillera de Los Llanganati, Prov. Pastaza, Ecuador, elev. ca. 3750 m, 25-29 August 1959.

"Prostrate shrub; leaves dark green and shiny above, lighter below with dark veins. Buds deep pink; anthers yellow."

Miconia prietoi has the secondary leaf veins usually not at all evident, hypanthia 2.5-3 mm long, minutely ciliate calyx lobes, and a descending dorsal appendage on the stamen connectives. To M. barclayana I have also referred (but with sub-specific suspicions) Cazalet & Pennington 5444 (K, NY, US), from Lago San Marcos, Cayambe, Prov. Imbabura, Ecuador, elev. 3400 m; the Cayambe material shows rather densely fine-setulose branchlet nodes and slightly (to 0.4 mm) projecting external calyx teeth. The general habit of M. barclayana is rather like that of M. chionophila Naud. and M. pernettifolia Triana.

MICONIA CLADONIA Gleason, Bull. Torrey Club 52: 453. 1925.

Miconia rudis Cogn. & Gl. ex Gleason, Brittonia 1: 123. 1932.

The isotypes (US) of M. cladonia and M. rudis are alike; both show leaf cilia ca. 0.7-0.8 mm long, as well as sporadic smooth gland-tipped hairs near the branchlet nodes (a feature not noted in the original descriptions and not seen in other than collections from Cauca, Colombia). Other material varies considerably in the leaf-cilia length as well as the length (but not quality) of the cladonioid branchlet and primary leaf vein hairs. Included in this spectrum are collections from various parts of Colombia (Antioquia, Cauca, Cundinamarca, Huila, Valle) and Ecuador (Harling 4086, S, from Santa Barbara de Sucumbios, Napo; Steyermark 53604, from Río Tintas, Morona-Santiago). The species is well accommodated within Sect. Cremanium, rather than Sect. Chaenopleura.

MICONIA MANICATA Cogn. & Gleason ex Gleason subsp. ECUADORENSIS Wurdack, subsp. nov.

Foliis proportionaliter angustioribus ciliis marginalibus ca. 0.2 mm longis petalis minoribus differt.

Type Collection: G. Harling & L. Andersson 12825 (holotype GB; isotype US), collected on the Limón (General Plaza)-Gualaceo road 20-30 km from Limón, Prov. Morona-Santiago, Ecuador, elev. 2000-2300 m, 25 March 1974. "Shrub ca. 2.5 m high. Corolla white."

An isotype of the typical subspecies (Lehmann 6688, US) shows leaf blades with length/width ratio 2.4-2.7 (rather than 3.7-4) and marginal cilia ca. 1 mm long, as well as petals ca. 1.6 X 1.3-1.4 mm (rather than 1 X 0.9-1 mm); both subspecies have anthers incompletely 4-pored. One other Ecuadorian collection with manicate branchlet nodes (Acosta Solís 5021, F, Campanas east of El Pan, Morona-Santiago) may also represent the new subspecies, but the material is in very poor condition.

MICONIA QUADRIPIORA Wurdack, sp. nov.

Sect. Cremanium. M. laetevirens Uribe affinis, foliorum venulis subtus crebris calycis lobis remotis minoribus differt.

Ramuli primum aliquantum argute quadrangulati demum teretes sicut petioli inflorescentiaque pilis pinoideis 0.1-0.3 mm longis densiuscule armati; linea interpetiolaris non evoluta. Petioli (1-)2-3.5 cm longi; lamina 8-17 X 3-7.5 cm elliptica vel paullulo ovato-elliptica apice gradatim vel subgradatim breviterque (ca. 1 cm) hebeti-acuminato basi acuta vel anguste obtusa, firmo membranacea et integra, obscure (ca. 0.1-0.3 mm) calloso-ciliolata, supra glabra, subtus secus nervos primarios densiuscule pilis pinoideis 0.3-0.5 mm longis puberula in nervis secundariis sparsiuscule pinoideo-puberula in superficie glabra, trinervata (pari tenui inframarginali neglecto) nervis secundariis 2-3 mm inter se distantibus nervulis subtus planis areolis ca. 0.3 mm latis. Panícula 4-12 cm longa multiflora, ramis primariis oppositis; flores 5-meri, pedicellis 0.4-0.6 mm longis, bracteolis ca. 0.7 mm longis linearibus caducis. Hypanthium (ad torum) 1-1.5 mm longum basin versus sparse eadumque furfuraceum; calycis tubus 0.1-0.2 mm longus, lobis interioribus 0.1-0.2 mm longis remotis, dentibus exterioribus obscuris non vel vix (0.05 mm) eminentibus. Petala 0.8-1 X 0.6-0.8 mm obovato-oblonga glabra. Stamina essentialiter isomorphica glabra; filamenta 1.6-1.8 mm longa; antherarum thecae 0.6-0.9 X 0.2-0.35 X 0.25-0.3 mm obovato-oblongae late 4-porosae; connectivum paullulo (0.1 mm) prolongatum non expansum. Stigma expansum 0.4-0.5 mm diam.; stylus 1.8-2.3 X 0.2-0.3 mm glaber; ovarium 3-loculare et ca. 1/2 inferum, cono glabro. Type Collection: G. Harling 3800 (holotype S), collected near Mera, Prov. Pastaza, Ecuador, elev. 1160 m, 31 Dec. 1958. "Shrub 6-8 m. Fl. yellowish white."

Paratypes: Ecuador Asplund 18940 (S), from Mera, Prov. Pastaza, elev. ca. 1050 m. "Tree about 15 m. Flowers white"; R. Scolnik 1505 (NY), from El Balcón between Gualaquiza and Sigüig, Prov. Morona-Santiago (?). "Arboles 6-10 m. Flores blancas"; Little, Ortega, Samaniego, & Vivar 205 (US) and 214 (US), from near Sabanilla 13 km east of Loja, Prov. Zamora-Chinchipe, elev. 1800 m. "Arbol de 8 m." "Arbol de 15 m, 15 cm diam." Peru: Tillett 673-165 (US), from Cpto. Buenos Aires across Río Chiriaco from Yambrasbamba, Prov. Bongará, Depto. Amazonas, elev. 1860-2000 m, 2 Mar. 1967. "Tall shrub or small tree 4 m. Flowers creamy olive green with strong fragrance."

The suggested Colombian relative has leaf vein areoles 0.5-1 mm wide and oblate contiguous calyx lobes 0.4-0.5 mm long. The type collection of M. laetevirens has rotund-quadrangular branchlets; a collection in very young bud from Putumayo (Cuatrecasas 11412, US) with the pubescence and foliage (including lax venule areoles) as in the Cundinamarca type but sharply quadrangular branchlets has been tentatively referred to M. laetevirens rather than M. quadripora. Miconia brevitheca Gleason has relatively broader leaf blades with lax venule areoles 1-1.5 mm wide and the primary vein puberulence beneath only 0.1 mm long,

as well as rotund-quadrangular branchlets. The general aspect of M. quadripora is somewhat like that of M. pulverulenta R. & P. (leaves with longer cilia and stellate hairs on the lower leaf surfaces; hypanthium definitely stellulate-puberulent; calyx lobes 0.4-0.5 mm long; anthers 2-pored; stigma scarcely expanded), M. clathrantha Naud. (Isotype FI: leaves with pubescence very sparse and flattened-dendroid and marginal cilia ca. 0.4 mm long; calyx lobes ca. 0.4 mm; anthers 2-pored), and M. paradisica Wurdack (leaf surface pubescence beneath stipitate-stellate; dioecious; anthers 2-pored).

NOTES ON NEW AND NOTEWORTHY PLANTS. CXII

Harold N. Moldenke

PAEPALANTHUS URBANIANUS var. **ANGUSTIFOLIUS** Moldenke, var. nov.

Haec varietas a forma typica speciei foliis ramorum angustioribus lanceolatis basaliter non cordatis recedit.

This variety differs from the typical form of the species in having its stem leaves narrower, more nearly uniform in width to the apex of the stem, oblong-lanceolate, 1.5--2 cm. long, basally about 4 mm. wide and not cordate, glabrous and shiny on both surfaces, erecto-ascending, not closely appressed.

The type of this variety was collected by H. S. Irwin, R. Reis dos Santos, R. Souza, and S. F. da Fonsêca (no. 24936) on rocky slopes about 10 km. south of Alto do Paraíso (formerly Veadeiros), at 1000 m. altitude, Chapada dos Veadeiros, on the Planalto do Brasil, Goiás, Brazil, on March 23, 1969, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as an herb about 75 cm. tall, with heads gray during anthesis.

STUDIES IN THE LIABEAE (ASTERACEAE). XII.

A NEW SPECIES OF MUNNOZIA FROM

COSTA RICA

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The genus Munnozia contains about forty species which are mostly restricted to South America. The genus has previously been known in Central America only on the basis of the widely distributed M. senecionidis Benth. which extends its range into Costa Rica and western Panama. Recent collections have unexpectedly revealed a thoroughly distinct undescribed member of the genus that seems endemic to central Costa Rica. The specimens are the result of the collecting program of Dr. R. L. Wilbur of Duke University and the species is here named in his honor.

Munnozia wilburii H. Robinson, sp. nov.

Plantae suffrutescentes usque ad 2 m altae. Caules hexagonales hirsuti et appresse aliquantum evanescentiter albo-arachnoideo-tomentosi, nodis in alis petiolarum connatis inclusis. Folia opposita, petiolis ad 8 cm longis distincte alatis, alis inferne ad 16 mm latis superne angustioribus; laminae deltoideo-ovatae plerumque 9-16 cm longae et 5-12 cm latae base truncatae margine multo dentatae et mucronate denticulatae apice breviter acuminatae supra hirtellae subtus dense albe persistentiter arachnoideo-tomentosae, nervis secundariis basilaribus congestis in partibus trinervatis vel subtrinervatis. Inflorescentiae terminales profuse laxe pyramidaliter paniculatae inferne oppositae et superne plerumque alternate ramosae, pedunculis 4-10 cm longis sparse pallide hirtellis et dense albo-arachnoideo-tomentosis. Capitula plerumque ca. 10 mm alta et 10-12 mm lata. Squamae involucri 30-35 late ovatae vel late oblongae distincte inaequales 4-7 mm longae et plerumque 2-3 mm latae apice obtusae vel breviter acutae extus glabrescentes 5-10 striatae inferne subcarnosae superne breviter herbaceae, bracteis exteriores minimis persistentiter sparse arachnoideo-tomentosae; receptacula fimbriis squamiformibus laciniatis ad 2 mm longis. Flores radii 40-45; corollae flavae, tubis 4-6 mm longis plerumque dense puberulis,

limbis 12-17 mm longis ad 2 mm latis base dense pilosis superne glandulosis et sparse puberulis. Flores disci 40-50; corollae flavae 7-8 mm longae, tubis 4-5 mm longis dense puberulis, faucis ca. 1 mm longis abrupte late campanulatis base sparse puberulis, lobis ca. 2 mm longis 0.8-1.0 mm latis extus multi-glanduliferis distaliter in fasciculo dense pilosis; filamenta in parte superiore ca. 0.3 mm longa; thecae nigrescentes ca. 2 mm longae, cellulis endothecialibus solum in parietibus transversalibus noduliferis; appendices antherarum oblongae ca. 0.3 mm longae et 0.2 mm latae. Achaenia ca. 1.3 mm longa longe setifera ca. 10-costata; setae pappi longiores 35-40 plerumque ca. 5 mm longae subtiliter flavescentes apice attenuatae non incrassatae, setae exteriores in seriebus indistinctis brevioribus 0.3-0.5 mm longae. Grana pollinis 30-37 μ diam.

TYPE: COSTA RICA: Cartago: steep banks above the Río Grande de Orosi about 9 km southeast of the bridge at Tapantí at an elevation of about 1600 m. Shrub 2 m tall. Ray and disk corollas bright yellow. 20 Dec. 1974. R.L.Wilbur and J.L.Luteyn 18548 (Holotype DUKE; Isotypes CR, US). PARATYPE: COSTA RICA: Cartago: Hwy. 224 on property of ICE hydroelectric plant ca. 20-24 km east of the church in Orosi, beyond the town of Tapantí. Steep roadside banks and disturbed sites adjoined by virgin cloud forests. Elev. ca. 1500-1800 m. Shrub to 3-4 ft. tall. Ray florets yellow. Disk florets yellow, abruptly flaring. Pappus bristly, light brown. Anthers brown. 3 Jan. 1974. F.Almeda Jr. 2378 with M.Flowers, R.Promack, J.Utley, K.Utley, and R.Wyatt (DUKE, US).

Munnozia wilburii has the sagittate leaves and pyramidally paniculate inflorescence with long peduncles that indicate relation to the subgroup of Munnozia containing M. senecionidis. Most members of the group of species differ by the more equal length of the involucre bracts or by different leaf width along with other details of floral size and structure. The probable closest relative is M. senecionidis but a number of differences separate the new species including the prominently winged petiole, the less distinct trinnervation at the base of the leaf blade, the presence of more alternate branching in the distal parts of the inflorescence, the more strongly differentiated herbaceous tips of the involucre bracts, the puberulous rather than pilose tubes of the disk corollas and the short throats of the disk corollas. The pubescence of the achene is also comparatively sparse.



Munnozia wilburii H. Robinson, Holotype, Duke University. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXXI.

TWO NEW SPECIES OF TRICHOAGONIA.

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Among recent collections that have been examined are the following two new species of Trichogonia.

Trichogonia bishopii R. M. King & H. Robinson, sp. nov. Plantae suffrutescentes vel frutescentes usque ad 1 m altae mediocriter ramosae. Caules fulvescentes teretes striati dense breviter stipitato-glanduliferi. Folia opposita, petiolis 5-10 mm longis; laminae ovatae 3-5 cm longae et 1.5-3.0 cm latae base subtruncatae vel leniter cordatae margine multo crenato-serrulatae apice breviter acutae utrinque dense glandulo-punctatae supra dense hirtellae subtus plerumque in nervis et nervulis subtomentosae. Inflorescentiae dense subcymosae, ramis 7-17 mm longis dense breviter stipitato-glanduliferis. Capitula 9-11 mm alta et 8-12 mm lata; squamae involucri eximbricatae ca. 25-30 biseriatae oblanceolatae plerumque 5-6 mm longae et 1.0-1.2 mm latae apice anguste acutae extus bicostatae dense glandulo-punctatae et hirtellae. Flores ca. 60-70 in capitulo; corollae lavandulae ca. 4 mm longae infundibulares, tubis 1.7-2.0 mm longis glabris; faucis 1.5-2.0 mm longis superne puberulis, lobis breviter triangularibus ca. 0.5 mm longis et latis, extus dense hirtellis; filamenta in parte superiore ca. 0.25 mm longa; thecae 1.2-1.4 mm longae; appendices antherarum late oblongae 0.15-0.30 mm et ca. 0.23 mm latae; appendices stylorum leniter vel non clavatae; achaenia 3.5-4.0 mm longa plerumque in costis minute setifera sparse glandulo-punctata base distincte stipitata; setae pappi ca. 30 ca. 3.5-4.0 mm longae dense subplumosae. Grana pollinis ca. 20-22 μ in diametro.

TYPE: BOLIVIA: SANTA CRUZ: one km from Comarapa on road to Cochabamba. Elevation ca. 6200 ft. February 5, 1978. R. M. King & L. E. Bishop 7626 (Holotype US). Paratype: same locality King & Bishop 7630 US).

Trichogonia bishopii is similar in habit to T. rhabdocarpa B. L. Robinson and T. salviaefolia Gardner but differs from these and most other members of the genus by the short hairs on the subplumose setae. Other notable features of the new species are the densely glanduliferous stems, leaves, pedicels and involucres and the long tips of the involucre bracts.

Trichogonia harleyi R. M. King & H. Robinson, sp. nov. Plantae suffrutescentes vel frutescentes usque ad 1.5 m altae paucе ramosae. Caules fulvescentes teretes striati dense puberuli et sparse glandulo-punctati. Folia alternata dense spiraliter inserta parva breviter petiolata ex folio in fasciculo axillaris indistincta, petiolis 1-2 mm longis; laminae minute obovatae plerumque 2-3 mm longae et latae margine distaliter 1-2-crenulatae apice obtusae vel rotundatae utrinque dense puberulae et glandulo-punctatae. Inflorescentiae in ramis terminales vix scaposae paucicapitatae subthyrsoid-paniculatae, ramis 3-5 mm longis dense puberulis et glandulo-punctatis. Capitula 7-8 mm alta et 6-7 mm lata; squamae involucri eximbricatae ca. 16 biseriatae oblanceolatae plerumque 4-5 mm longae et superne 1.0-1.5 mm latae apice subscariosae rubrescentes obtuse dense fimbriatae extus bicostatae dense puberulae et glandulo-punctatae. Flores ca. 10 in capitulo; corollae purpurascens ca. 4 mm longae infundibulares, tubis ca. 1.5 mm longis glabris, faucis ca. 2 mm longis superne sensim latiores extus glanduliferis superne et in lobis dense hirtellis, lobis breviter triangularibus ca. 0.3 mm longis et 0.3-0.4 mm latis; filamenta in parte superiore ca. 0.4 mm longa; thecae ca. 1 mm longae; appendices antherarum late oblongae ca. 0.2 mm longae et latae; appendices stylorum plerumque subteretes apice distincte clavatae; achaenia ca. 2.5 mm longa dense setifera et minute glandulifera base non stipitata; setae pappi ca. 16 ca. 3 mm longae dense plumosae. Grana pollinis ca. 20 μ in diametro.

TYPE: BRAZIL: BAHIA: 16 km NW of Lagoinha on side road to Minas do Mimoso. 950-1000 m. March 8, 1974. R. M. Harley 16977 (Holotype US, Isotype K).

The new species with its close set alternate leaves seems to be related to Trichogonia hirtiflora DC. of Minas Geras but the latter has longer leaves with prominent axillary fascicles, has more flowers in the heads, and has narrower bases on the achenes. T. hirtiflora, on the basis of a type photograph, should include T. apparicioi Barroso in its synonymy. The new species is perhaps most closely related to T. spathulaefolia Mattf. of Bahia which has fascicles of leaves alternately inserted, but the Mattfeld species according to the description has larger leaves, ca. 30 flowers in the heads, narrow bases on the achenes and no glands on the achenes.



Trichogonia bishopii R.M.King & H.Robinson,
Holotype, United States National Herbarium, Photos
by Victor E. Krantz, Staff Photographer, National
Museum of Natural History.

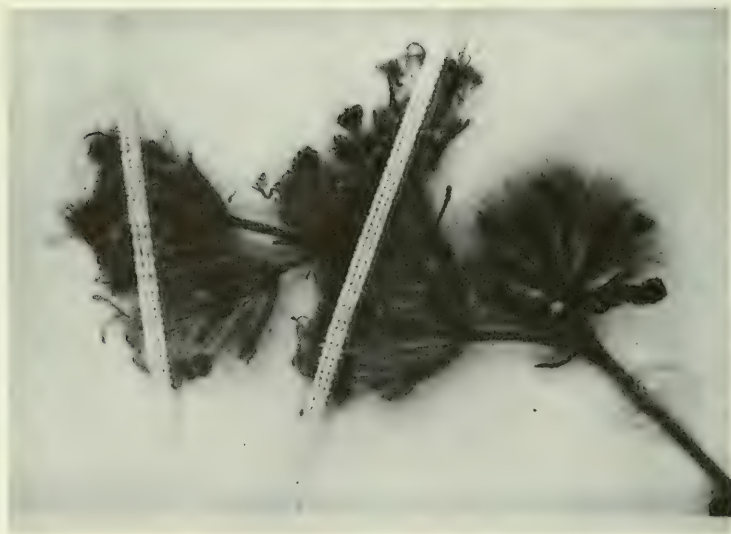


UNITED STATES

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NATIONAL HERBARIUM

Trichogonia harleyi R.M.King & H.Robinson,
Holotype, United States National Herbarium.



Enlargements of heads of Trichogonia. Top: T. bishopii. Bottom: T. harleyi.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLXXXII.

A NEW GENUS, BISHOVIA.

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The unresolved generic problems in the Eupatorieae occur in South America where a number of species are found which lack striking features but which show no close relation to known genera. New material is often essential for proper interpretation of poorly known species, and the most useful data is derived from the discovery of new species that clarify relationships.

A new collection from Bolivia represents a new species sharing the same type of generally alternate leaf arrangement, viscid pubescence and eximbricate involucre seen in Eupatorium mikaniifolium B. L. Robinson. The latter species has previously been placed by us in the genus Chacoa (King & Robinson, 1975) but re-evaluation now suggests that there is no close relation to the type species of that genus. The discovery of the bolivian species lends greater significance to the pubescence, phyllotaxy and involucre characters with the latter particularly marked. Bishovia is distinct from most genera of the tribe by the very narrow, long-tipped strongly bicostate involucral bracts. More illusive characters such as the diffusely cymose inflorescence, longer corolla lobes and the larger cells of the carp-opodium further tend to exclude the genus from the Koanophyllon relationship to which Chacoa belongs. The tube of the corolla in Chacoa is unusually narrow for a member of the Koanophyllon relationship. The suggestion of such narrow tubes in Eupatorium mikaniifolium was the result of distortion in the corollas of the type specimen. Reexamination shows broader tubes to be natural as in B. bolivensis, furnishing a further generic distinction.

Bishovia R. M. King & H. Robinson, gen. nov.
Asteracearum (Eupatorieae). Plantae herbaceae vel suffrutescentes in caulibus foliis pedicellis et squamis involucri minute stipitato-glanduliferis. Folia superiora alternata distincte tenuiter petiolata; laminae ovatae serratae vel sublobatae base in medio prominentiter trinervatae apice acutae. Inflorescentiae diffuse cymosae; capitula late campanulata; squamae involucri eximbricatae vel indistincte subimbricatae lineari-lanceolatae apice subalternatae extus distincte bicostatae; receptacula glabra plana vel leniter convexa;

flores 30-60; corollae infundibulares, tubis latioribus indistinctis, lobis triangularibus longioribus quam latioribus utrinque laevibus extus glanduliferis interdum minute setiferis; parietibus cellularum sinuosis; filamenta antherarum mediocriter cylindrica, cellulis plerumque breviter oblongis, cellularum noduliferis non annulatis; cellulae endotheciales subquadratae; appendices antherarum oblongae vel ovato-oblongae longiores quam latiores; basi stylorum angusti glabri; appendices stylorum lineares minute dense mamillosae; achaenia prismatica 5-costata basi angustiora; carpodia breviter cylindrica, cellulis 3-7-seriatis subquadratis plerumque 12-15 μ diam; setae pappi 30-40 superne non vel leniter latiores, cellulis apicalibus acutis. Grana pollinis 20-22 μ diam.

Species typica: Bishovia boliviensis R.M.King & H. Robinson

The genus is named for Dr. Luther Earl Bishop, one of its collectors.

Bishovia boliviensis R.M.King & H. Robinson, sp. nov. Plantae suffrutescentes ca. 0.5 m altae, caules folia pedicellae et bractae involucri dense minute stipitato-glanduliferae et puberulae immixtae. Caules fulvescentes substriati. Folia inferioria opposita superioria alternata, petiolis tenuibus 3-6 mm longis; laminae ovatae vel late ovatae 2-5 cm longae et 1.0-3.5 cm latae base rotundatae vel late cuneatae in medio valde trinervatae margine grosse serratae apice argute acutae inferne vix pallidiores. Inflorescentiae diffuse cymosae, pedicellis 5-18 mm longis; capitula ca. 8 mm alta late campanulata; bractae involucri ca. 25 lineari-lanceolatae ca. 2-seriatae 3-5 mm longae 0.5-0.7 mm latae apice subattenuatae extus distincte bicostatae; flores ca. 50-60; corollae lavandulae 4 mm longae infundibulares, tubis ca. 1.1 mm longis minute pauce glanduliferis, faucis ca. 2.5 mm longis, lobis triangularibus ca. 0.6 mm longis et 0.4 mm latis extus glanduliferis; filamenta in parte superiore ca. 0.25 mm longa; thecae ca. 1.3 mm longae; appendices antherarum ovato-oblongae ca. 0.3 mm longae et 0.2 mm latae; achaenia 2.8-3.0 mm longa minute multo spiculifera; setae pappi ca. 32 plerumque ca. 4 mm longae apice leniter latiores, Grana pollinis ca. 22 μ diam.

TYPE: BOLIVIA: Santa Cruz: one km from Comarapa on road to Cochabamba. Elevation 6200 ft. February 5, 1978. R. M. King & L. E. Bishop 7625 (Holotype US).

The new species differs from B. mikaniifolia most notably by the serrate rather than sublobate leaves, by the lack of minute setae on the corolla lobes, and by the lack of minute glands on the achenes. There also seem to be more flowers in the heads of B. boliviensis.

Bishovia mikaniifolia (B. L. Robinson) R. M. King & H. Robinson, comb. nov. Eupatorium mikaniifolium B. L. Robinson, Contr. Gray Herb. n. s. 104:22. 1934. Argentina.

Reference

King, R. M. & H. Robinson 1975. Studies in the Eupatorieae (Asteraceae). CLIV. A new genus Chacoa. Phytologia 32:275-275.

Acknowledgement

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Bishovia boliviensis R.M.King & H.Robinson,
Holotype, United States National Herbarium, with
enlargement of heads. Photos by Victor E. Krantz,
Staff Photographer, National Museum of Natural
History.

Revision of the native South American species of Linum (Linaceae)

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INTRODUCTION

Linum is a genus of perhaps 160 species, widely distributed throughout the world, principally in temperate and subtropical regions. Five sections, Linum, Cathartolinum, Syllinum, Dasylinum and Linastrum, are commonly recognized. A sixth, Cliococca, has been treated as a separate genus (Rogers and Mildner, 1972). Section Linum is almost entirely Old World (two of the twenty-five to thirty species are found in western North America); Cathartolinum is comprised of but a single species, essentially Old World, but probably introduced into northeastern North America; Syllinum and Dasylinum are entirely Old World; Linastrum, to which all of the native South American species belong, is found in both Old and New Worlds. These general distributions suggest that the genus may have had its origin or center of dispersal in the Old World, possibly in the eastern Mediterranean region, the only area where representatives of all five sections can be found.

Early publications dealing with the South American species (St. Hilaire, 1825; Schiede, 1826; Gay, 1865; Urban, 1877a,b; and Reiche, 1896) were more or less provincial in their treatments. Planchon's monumental study of the genus (1847, 1848) described and classified all of the known species while Winkler (1931) listed the South American species. A number of recent publications have all been more or less local in their scope. One of the aims of the present study has been to update our knowledge, utilizing collections which have accumulated, to try to assess the relationships on a continental basis for the first time and to clarify relationships of South American plants to those of the other parts of the world. Earlier studies of the North American flaxes of the section Linastrum (Rogers, 1963, 1968, 1969) revealed that the species considered on comparative morphological bases to be among the most primitive on that continent closely resemble some of the species of southern Africa. It has seemed worthwhile to study the several South American plants of this section, to try to place them in their proper position with respect to the North American and the Old World, particularly southern African, plants. This paper summarizes some of the results of this study.

With the help of a grant from the Penrose Fund of the American Philosophical Society to the senior author and a Sigma Xi Grant-in-Aid of Research to the junior author, it has been possible to observe in the field and to collect most of the South American species and to harvest cytological materials and seeds of a number of species. Material from 24 herbaria has been examined. The cooperation of the many curators is hereby gratefully acknowledged.

KEYS TO AND DESCRIPTIONS OF THE SOUTH AMERICAN SPECIES

Glabrous or puberulent perennial or rarely annual herbs; leaves simple, sessile, entire or rarely denticulate, opposite, alternate, glabrous or sometimes pilose near the base; stipular glands present or none; inflorescence a terminal scorpioid cyme, this sometimes much reduced; sepals five, imbricate, entire or denticulate; petals five, obovate, convolute, separate, fugacious, yellow, the buds often reddish without; stamens five, united basally, with or without diminutive intervening staminodia; ovary superior, five-carpelled, but becoming more or less ten-locular through the intrusion of incomplete false septa; styles five, separate or united; stigmas capitate; fruit ovate, obtuse to acute, dehiscing into ten one-seeded segments.

1. Styles free or nearly so.

2. Septa prominently ciliate.

1. L. burkartii

2. Septa not prominently ciliate.

3. Stem leafy to the summit.

2. L. organense

3. Stem not leafy to the summit.

4. Sepals thin-textured, conspicuously
scarious-margined.

5. Leaves broadly lanceolate to ovate.

6. Stipular glands present.

3. L. smithii

6. Stipular glands absent.

4. L. littorale

5. Leaves linear or narrowly lanceolate.

7. Inflorescence open, branched.

4. L. littorale

7. Inflorescence not open, branched.

8. Flowers mostly subsessile on
short, lateral bracteate branches.5. L. brevifolium8. Flowers solitary or paired at end
of slender, sparsely-leaved stems.6. L. palustre4. Sepals thick-textured, margin not
conspicuously scarious.

9. Stipular glands absent.

10. Petals ca 10 mm long; styles ca 5
mm long or less.

- 11. Stems long, slender; upper leaves closely appressed, inflorescence much reduced. 11. L. filiforme
- 11. Stems, leaves, inflorescence not as above.
- 12. Leaves persisting to summit of inflorescence; Galapagos Islands. 18. L. cratericola
- 12. Leaves not as above; locality other than Galapagos Islands.
- 13. Stems with few or no branches below the inflorescence.
- 14. Leaves thick-textured; inflorescence small and more or less compact; larger leaves mostly less than 2 cm long. 7. L. carneum
- 14. Leaves thin-textured; inflorescence open; larger leaves mostly more than 2 cm long. 8. L. erigeroides
- 13. Stems densely branched. 9. L. scoparium
- 10. Petals ca 15 mm long; styles ca 10 mm long. 16. L. chamissonis
- 9. Stipular glands present.
- 15. Stiffly upright, shrubby; Galapagos Islands. 19. L. harlingii
- 15. Not as above; locality other than Galapagos Islands.
- 16. Stems long, slender; upper leaves closely appressed; inflorescence much reduced. 11. L. filiforme
- 16. Stems, leaves, inflorescence not as above.
- 17. Styles more than 2.5 mm long; leaves linear to narrowly lanceolate. 10. L. oligophyllum

17. Styles less than 2.5 mm long; leaves lanceolate to ovate.
12. L. prostratum
1. Styles clearly united.
18. Styles united about one-half way or less.
19. Branches mostly spreading to divaricate; upper pedicels and leaf bases pilose.
13. L. polygaloides
19. Branches mostly rather stiffly spreading-ascending; upper pedicels and leaf bases glabrous.
14. L. ramosissimum
18. Styles united nearly to the summit.
20. Plants much branched, with spreading, procumbent branches; petals 10 mm long or less.
15. L. cremnophilum
20. Plants not as above; petals 15 mm long or longer.
17. L. macraei

1. LINUM BURKARTII Mildner, Phytologia 23:439. 1972. Type: Rosengurtt Gallinal 5755, Estancia Rincon de Santa Elena, Picada Castro, Arroyo Mansavilliagra, Dept. Florida, Uruguay, Nov. 1946 (holotype: SP; isotypes: MVM,US). (Fig. 1).

Perennial glabrous herb, 18-50 cm tall; stems one or several, branching near the base and in the inflorescence; leaves linear, 1-nerved, the larger 7.5-14.0 mm long, 0.8-1.4 mm wide, opposite near the base, alternate and reduced above, appressed; stipular glands absent; flowers in an open paniculate inflorescence, subsessile or on pedicels up to ca 1 cm long; sepals lance-ovate to ovate, sharply acuminate, mostly 1-nerved, the larger 3.7-4.4 mm long, margins scarious, prominently glandular-denticulate, inner tip glabrous; petals obovate, clawed, 7-9 mm long; stamens 3-4 mm long; staminodia small, deltoid; anthers broadly elliptical, 0.5-1.0 mm long; styles free, 3.5-4.5 mm long; fruit broadly ovate, sharply pointed, 2.2-2.5 mm high, 2.7-3.0 mm in diameter; false septa ca 3/4 completed, with margins conspicuously ciliate; seeds brown, elliptic, 1.7-1.9 mm long.

Linum burkartii is found in rocky or sandy places in southern Uruguay and eastern Argentina. Within its range are L. carneum, L. scoparium and L. littorale, from all of which it may be distinguished by the sharply pointed fruit and the prominently ciliate septa. Herbarium material of

L. burkartii has most commonly passed as L. littorale, but its relationship to that species or to any other South American species is not clear. As will be amplified later, the closest relatives of L. burkartii may well be species such as L. rupestre of Mexico and L. holstii of Africa, which it resembles closely.

In addition to the type specimen, twelve collections have been examined. Its distribution is shown in Fig. 24.

2. LINUM ORGANENSE Gardn., Hook. Lond. Jour. Bot. 4:100. 1845. Type: Gardner 5683, dry, bushy places, near the summit of the Organ Mts., Rio de Janeiro, Brazil (holotype: K; isotypes: BM, G). (Fig. 2).

Perennial glabrous herb, 21-85 cm tall, simple or branched at the base and much branched in or near the inflorescence, the lower stems becoming woody; leaves lanceolate to ovate or obovate, 1-nerved, mostly entire, rarely slightly denticulate, the larger 10-19 mm long, 4.0-9.0 mm wide, opposite below and alternate above, imbricate; stipular glands absent; flowers few on short pedicels in a very leafy inflorescence; sepals lanceolate to ovate, shortly acuminate, mostly 3-nerved, the larger 3.3-3.6 mm long, margins entire, thin or somewhat scarious, inner tip pilose; petals obovate, clawed, ca 9-12 mm long; stamens ca 3.5-3.7 mm long; staminodia small, filiform or narrowly deltoid; anthers narrowly elliptic, ca 1.0-1.3 mm long; styles free at the base, ca 4-6 mm long; fruit ovate, sharply pointed, ca 2.2-2.6 mm high, 2.2-2.5 mm in diameter; false septa ca $\frac{1}{2}$ completed; seeds subelliptic, brown, ca 2.0-2.3 mm long.

Linum organense is restricted to the Organ Mts. near Rio de Janeiro, where it is found in fields and grassy places at elevations between 1400 and 2000 m. The broad leaves and few-flowered leafy inflorescence not only distinguish it from others in the area but make it one of the most easily recognized of all of the South American species.

In addition to the type specimen, 24 collections have been examined. Its distribution is shown in Figure 24.

3. LINUM SMITHII Mildner, Phytologia 23:439. 1972. Type: Reitz and Klein 7999, Serra do Oratorio, Bom Jardim, Sao Joaquin, Santa Catarina, Brazil, Dec. 15, 1958 (holotype: UC; isotypes: G,NY,US). (Fig. 3).

Perennial glabrous herb, 30-70 cm tall, simple or branched at the base and in or near the inflorescence; lower stems often becoming woody; leaves 1-nerved, entire or somewhat denticulate, the larger 12-19 mm long, 4.0-5.2 mm wide, reduced in the inflorescence, opposite below, alternate above, lanceolate to ovate or obovate; stipular glands present; inflorescence open, paniculate; flowers shortly pedicellate, scattered; sepals lanceolate to ovate, shortly acuminate, mostly 3-nerved, the larger 2.9-3.6 mm long, margins denticulate and more or less scarious, inner tip pilose; petals obovate, clawed, ca 7.5-10.0 mm long; stamens ca 3.8-4.5 mm long; staminodia small, filiform or narrowly deltoid; anthers narrowly elliptic, ca 0.7-1.2 mm long; styles free at the base, ca 3.3-4.0 mm long; fruit ovate, sharply pointed, ca 2.2 mm high, 2.3 mm in diameter; false septa ca $\frac{1}{2}$ completed; seeds subelliptic, brown, ca 2 mm long.

Linum smithii is found in moist areas at elevations of 1400 to 1600 m in the eastern parts of Santa Catarina and Rio Grande do Sul provinces of southern Brazil. It is distinguished from other species in the area except L. littorale var. oblongifolium by its comparatively broad leaves and from that variety by the presence of stipular glands. Fruit, acute or sharp pointed at the summit, serve to help distinguish it from any other species in its range. Although it has in the past been considered a part of L. organense, and some specimens we have examined have been annotated "L. organense var. smithii", there are sufficient differences in flower and fruit morphology, as well as habit, to show that these two plants warrant separation at the species level. The ranges of the two are separated about 900 km. Both L. smithii and L. organense have certain attributes which are also found in some plants of South Africa and Mexico. Partly on these bases, these plants are thought to be among the most primitive of the genus in South America and, as will be discussed later, may serve as a theoretical starting point for evolutionary trends which have led ultimately to most other South American species.

In addition to the type specimen, only four other collections have been examined. The distribution is shown in Fig. 24.

4. LINUM LITTORALE St. Hil., Fl. Bras. Mer. 1: 133. 1825.

Perennial glabrous herb, 25-60 cm tall, branched at the base and in the inflorescence; leaves 1-nerved, the larger 6-17 mm long, 1.4-7.0 mm wide, opposite below, alternate above, appressed, linear to broadly lanceolate; stipular glands present or sometimes none; flowers shortly pedicellate in an open inflorescence, scattered or frequently solitary or in few flowered clusters at ends of inflorescence branches; sepals lance-ovate, acuminate, 3-5-nerved, thin with prominent nerves, the larger 2.9-4.0 mm long, margins scariosus, often involute, glandular-denticulate; petals lemon yellow, obovate, clawed, 5.5-7.4 mm long; stamens 3.5-4.5 mm long; staminodia small, narrowly deltoid; anthers ca 0.9 mm long; styles free or very briefly connate at the base, ca 2.8-4.0 mm long; fruit broadly ovate, obtuse, 1.8-2.3 mm high, 2.5-2.9 mm in diameter; false septa ca $\frac{1}{2}$ completed; inner margin of true septa sparsely ciliate; seeds brown, sub-elliptic, 1.8-2.0 mm long.

A conservative treatment of this, the most variable of the South American species, distinguishes two varieties:

Leaves linear to narrowly lanceolate

L. littorale var. littorale

Leaves broadly lanceolate to ovate

L. littorale var. oblongifolium

L. LITTORALE VAR. LITTORALE. Type: St. Hilaire 61, in arenosis maritimis prope lacum Araruama, Rio De Janeiro, Brazil (holotype: P). (Fig. 4).

Linum littorale var. glandulosum St. Hil., Fl. Bras. Mer. 1: 134. 1825. Type: St. Hilaire 1806, Ararangua, Santa Catarina, Brazil (holotype: P).
Linum junceum St. Hil., Fl. Bras. Mer. 1: 134. 1825. Type: St. Hilaire 403, Sao Joao del Rey, Minas Gerais, Brazil (holotype: P).

Linum littorale forma glomeratum Urb., Mart., Fl. Bras. 12: 2: 463. 1877. Type: Sello s.n. (not seen).

Linum littorale St. Hil. var. panniculatum Urb., Mart. Fl. Bras. 12: 2: 464. 1877. Based on L. littorale St. Hil.

Linum littorale St. Hil. var. bahiense Urb., Mart. Fl. Bras. 12: 2: 464. 1877. Type: Schott 4582, Salvador (isotypes: F,US).

Linum littorale var. littorale is found in a variety of more or less open habitats along the eastern part of the continent, mostly near the coast from Salvador, Brazil, southward to southern Uruguay. It is an extremely variable taxon, especially in habit. Several of these variants have been named but, based on the material available at this time, they tend to merge with one another to such a degree that attempting to distinguish them formally seems impracticable. Our collection from the approximate type locality near Lake Araruama has been found to have a chromosome number of $n=36$, double the number of any of the other eastern South American species thus far counted. It also has pollen grains with six germ pores, rather than the usual three, a feature not uncommon in tetraploids in this genus. In Santa Catarina province there is a population characterized by the absence of stipular glands, while in the southernmost part of the range are found plants which tend toward L. scoparium and L. carneum in having sepals of thicker texture, less prominently toothed (compare insets in figs. 4 and 8). Smith and Klein 13536 from near Horizonte, Paraná, is a compact plant with closely imbricate leaves which deserves further study, as does this whole complex, among the most troublesome to classify of any on the continent.

Approximately 56 collections have been examined. The distribution is shown in Fig. 25.

L. LITTORALE St. Hil. var. OBLONGIFOLIUM (Urb.) Rogers.

Phytologia 27: 440, 1974; Fl. Il. Catarinense. Lináceas: 22, 1975.

Type: Glaziou 8285, Prov. Rio de Janeiro, Brazil (isotype: K). (Fig. 5).

Linum junceum St. Hil. var. oblongifolium Urb., Mart. Fl. Bras. 12: 2: 467. Tab. 100, Fig. 2. 1877.

Differing from the typical variety principally by the key characters. Stipular glands, which are frequently but not consistently present in the typical variety, are lacking in the specimens of var. oblongifolium thus far examined.

Linum littorale var. oblongifolium is found in grassy fields and more or less boggy areas at about 1000 to 1500 m elevation, in the Organ Mountains near Rio de Janeiro and also intermittently southward to the provinces of Santa Catarina and Rio Grande do Sul. It resembles L. smithii, but differs from that species by the absence of stipular glands, which are always present in L. smithii.

About 15 collections have been examined. The distribution is shown in Fig. 25.

5. LINUM BREVIFOLIUM St. Hil. & Naud., Ann. Sc. Nat., Ser. II, Bot. 18: 30. 1842. Type: Gaudichaud 1274, Rio Grande do Sul, Brazil. 1833 (holotype: P). St. Hiltaire did not designate a specimen but this is the only

collection he annotated as L. brevifolium. (Fig. 6).

Linum oligophyllum Willd. var. squamifolium Schiede, Linnaea 1: 68: 1826. Type: Martius "Prov. of Bahia". The annotations on a Martius specimen of L. brevifolium at M indicate that it may be the basis for this variety. The original label does not give locality. L. brevifolium is not otherwise known from Bahia, however.

Linum brevifolium St. Hil. and Naud. f. majus Urb., Mart. Fl. Bras. 12: 2: 462. Tab. 98, Fig. 2, 1877. Both specimens cited by Urban for this form are L. brevifolium.

Linum brevifolium St. Hil. and Naud. f. oppositifolium Urb., Mart. Fl. Bras. 12: 2: 462. 1877. Sello collection cited by Urban has not been seen, but our interpretation of Linum brevifolium includes this form.

Linum brevifolium St. Hil. and Naud. f. rigidum Urb., Mart. Fl. Bras. 12: 2: 462. 1877. Sello specimen cited by Urban not seen, but almost certainly this form is part of L. brevifolium as we interpret it.

Linum brevifolium St. Hil. and Naud. f. squamifolium (Schiede) Urb., Mart. Fl. Bras. 12: 2: 462. 1877.

Perennial glabrous herb, 12-80 cm tall, simple or sparsely branched; stems strongly angled; leaves 1-nerved, the larger 3.5-9.0 mm long, 0.8-2.0 mm wide, the lower opposite, the upper alternate, appressed, linear to subulate; stipular glands inconspicuous or absent; inflorescence racemose or spicate; flowers subsessile, terminating densely bracteate, very reduced branches; sepals lanceolate, sharply acuminate, mostly 5-nerved, 3.1-4.0 mm long, glandular-denticulate, inner tip pilose; petals ca 8-10 mm long, obovate, sometimes retuse, clawed; stamens 3.5-4.3 mm long; staminodia small, deltoid or none; anthers narrowly elliptic, ca 0.7 mm long; styles separate, 3.6-5.1 mm long; fruit broadly ovate, obtuse, ca 1.5-2.0 mm high, 2.1-2.6 mm in diameter; false septa ca $\frac{1}{2}$ completed; seeds brown, elliptic, ca 1.4-1.7 mm long.

The distinctive racemose inflorescence of this species easily distinguishes it from all others. Nevertheless, flower and fruit structure clearly relate it so closely to L. littorale that it could be considered a variety of that species. Dusen 2256 from Curitiba (S) clearly combines traits of the two. L. brevifolium is found along stream banks, grassy and rocky fields and in marshy areas. It is confined to Brazil, but ranges from Minas Gerais southwestward along the coast to the vicinity of Porto Alegre, Rio Grande do Sul.

In addition to the type specimen, approximately 25 additional specimens have been examined. The distribution is shown in Fig. 25.

6. LINUM PALUSTRE Gardn., Hook. Lond. Jour. Bot. 4: 99. 1845. Type: Gardner 5682, near the summit of the Organ Mts., Rio de Janeiro, Brazil, Mar., 1841 (holotype: K; isotype: BM). (Fig. 7).

Perennial glabrous herb, 35-40 cm tall; stems slender, much branched at the base, infrequently in the inflorescence; leaves very reduced, 1-nerved, ca 2 (rarely 5) mm long, 0.5-1.5 mm wide, alternate or occasionally opposite below, closely appressed, subulate to narrowly lanceolate; stipular glands absent or, sometimes present at the base of floral bracts; flowers

terminal and solitary or rarely on bracteate, reduced branches as well; sepals narrowly ovate, acuminate, 3-5-nerved, the larger ca 2.5 mm long, glandular-denticulate, inner tip pilose; petals deep yellow, obovate, clawed, 6 mm long or more; stamens ca 4 mm long; staminodia small, deltoid; anthers narrowly elliptic, ca 0.5 mm long; styles separate, ca 2.5 mm long; fruit obtuse, ca 2 mm high, 3 mm in diameter; false septa 1/3 completed; seeds light brown, elliptic, ca 2 mm long.

The terminal flowers, reduced leaves and slender upright stems distinguish this species but it is very close to L. brevifolium and, like it, is so closely related to L. littorale that it could be considered a depauperate form of that species. L. palustre is known only from the southern part of Minas Gerais and in the Organ Mts., near Rio de Janeiro, where it is found in moist grassy areas.

In addition to the type specimen, the following collections have been examined: Glaziou 14500, Morro do Carapuca, Caraça, Minas Gerais (G, P, R) and Ule 2450, Sierra de Caraça, Minas Gerais (R,US). The distribution is shown in Fig. 25.

7. LINUM CARNEUM St. Hil., Fl. Bras. Mer. 1: 132. 1825. Type: St. Hil., Estancia de Suarez near St. Joseph, Cisplatine Prov. (Brazil) Uruguay (holotype: P). (Fig. 8).

Linum formosum Urb., Mart. Fl. Bras. 12: 2: 460. Tab. 97. Fig. 2. 1877. Type: Sello 3122, Brasilia Meridionali (M).

Perennial herb, 20-40 cm tall, glabrous or essentially so, branching at the base and in the inflorescence; leaves lanceolate, mostly 1-nerved, the larger 8-22 mm long, 3.0-5.0 mm wide, opposite below, alternate above; stipular glands none; inflorescence more or less compact, paniculate, with rather stiffly ascending-spreading branches; flowers shortly pedicellate, scattered; sepals ovate, acuminate, mostly 1-nerved, but sometimes with an additional pair of lesser nerves, 3.4-4.0 mm long, the outer often slightly longer than the inner, thick-textured, the inner denticulate; petals obovate, occasionally obcordate, shortly clawed, 7-10 mm long; stamens 4.0-4.5 mm long; staminodia small, deltoid; anthers subelliptic, 0.5-0.8 mm long; styles separate or barely connate at the base, 3-4 mm long; fruit depressed spheroidal, the summit reddish, 2.2-2.5 mm high, 2.8-3.1 mm in diameter; false septa ca ½ developed; true septa with occasional cilia at the inner margin; seeds brown, elliptic, ca 2 mm long.

The scattered flowers and fruit, the rather stiffly ascending-spreading branches, the depressed globose capsules and especially the thick-textured sepals serve to distinguish this species from others of the genus in this area, except L. erigeroides (see inset in Fig. 8). These two species are closely allied and in some earlier examinations of specimens, they were combined under the name L. carneum. With the study of further material, it seems clear that the form with narrow, thin-textured, more or less spreading leaves and with open and ample inflorescence deserves species recognition as L. erigeroides, while the form with broad, more or less appressed, thick-textured leaves and reduced inflorescence, should continue to be called L. carneum. L. carneum and L. erigeroides are probably very closely related

to L. scoparium, a frequently smaller and much-branched plant with inflorescence more diffuse, which is found in Uruguay, eastern Argentina and Bolivia, but which apparently does not extend into southern Brazil.

Linum carneum is an uncommon plant of grassy fields in the Province of Rio Grande do Sul, Brazil, and adjacent Uruguay. Four collections, besides the type specimen, were examined. The distribution is shown in Fig. 26.

8. LINUM ERIGEROIDES St. Hil., Fl. Bras. Mer. 1: 132. 1825. Type: St. Hil. Estancia de Suarez near St. Joseph, Cisplatine Prov., (Brazil) Uruguay (holotype: P). (Fig. 9).

Linum littorale St. Hil. var. corymbosum Urb. Mart. Fl. Bras. 12: 2: 464. 1877. Isotype: Sello 363. Montevideo. (M).

Linum littorale St. Hil. var. cuspidatum Urb. Mart. Fl. Bras. 12: 2: 464. 1877. Type: (not seen). Urban cited a Sello collection without date or number. A Sello collection (M) annotated by Urban as this variety proves to be L. erigeroides.

Perennial herb, 30-60 cm tall, glabrous, simple, branching at the base and in the inflorescence; leaves linear, mostly 1-nerved, the larger 18-35 mm long, 0.5-4.0 mm wide, opposite near the base of the plant, alternate above; stipular glands none; inflorescence open, paniculate, with rather stiffly ascending-spreading branches; flowers on pedicels becoming as much as 1 cm or more long, scattered; sepals lanceolate-ovate, subacuminate, mostly 1-nerved, but sometimes with an additional pair of lesser nerves, 3.0-4.0 mm long, thick-textured, the inner denticulate; petals obovate, shortly clawed, 7-10 mm long; stamens 4.0-4.5 mm long; staminodia small, deltoid; anthers subelliptic, 0.6-1.0 mm long; styles separate or barely connate at the base, 3-4 mm long; fruit depressed spheroidal, the summit reddish, 2.2-2.5 mm high, 2.9-3.2 mm in diameter; false septa ca $\frac{1}{2}$ developed; true septa with occasional cilia at the inner edge; seeds brownish, elliptic, ca 2 mm long.

Linum erigeroides grows in open, grassy, mostly moist or swampy areas, in the Rio Grande do Sul Prov. of Brazil, in Uruguay and in eastern Argentina. This species appears to be closely allied with L. carneum and L. scoparium. See L. carneum for a brief discussion of the differences.

About 45 collections have been examined. The distribution is shown in Fig. 26.

9. LINUM SCOPARIUM Griseb., Abh. Will. G8tt. 19: 103. 1874. Type: Lorentz 149, in collibus rupestribus, Cordoba, Argentina (isotype: CORD). (Fig. 10).

Perennial glabrous herb, 12-35 cm tall, the slender stems with more or less spreading branches at the base and to a lesser extent along the stem and in the inflorescence; leaves 1-nerved, the larger 3.6-14.0 mm long, 0.5-4.0 mm wide, the lower opposite, the upper alternate, appressed, linear, somewhat pilose at the base; stipular glands mostly absent; inflorescences open, paniculate; sepals lanceolate to ovate, sharply acuminate, 3-4 mm long, 3-5-nerved, glandular-denticulate, the inner tip pilose; petals obovate,

clawed, ca 8-10 mm long; stamens ca 4-6 mm long; staminodia small, deltoid; anthers elliptic, 0.5-1.0 mm long; styles separate, ca 3-5 mm long; fruit obtuse to somewhat pointed, reddish on the upper surfaces, 2.2-2.6 mm high, 2.8-3.6 mm in diameter; false septa ca 1/3 completed; true septa with a few cilia at the inner margin; seeds brown, subelliptic, ca 1.8-2.3 mm long.

Widely ranging, L. scoparium has been collected from western Uruguay northwestward through Argentina to west central Bolivia within a few km of the Peruvian border near La Paz. It is found in grassy loamy fields, rocky areas and occasionally moist places between 1000 and 3000 m elevation. It is a variable species in habit with some Bolivian populations more leafy. The type specimen is a comparatively coarse plant with short pedicels. It and other collections from near the type locality may differ enough to warrant restricting the name to plants of that area. Additional material needs to be collected. Throughout much of its range, L. scoparium is the only representative of the genus. The southernmost part of the range is shared with the closely related L. carneum and L. erigeroides; the differences between the two were described under the former. In the northern part of the range, plants which closely resemble the Peruvian L. oligophyllum may be found. The most conspicuous difference is the absence of stipular glands in L. scoparium. The ranges of the two as presently known are disjunct, with L. oligophyllum not being found in Bolivia and L. scoparium not having been collected in Peru, but additional field work in that region may reveal that the two species merge in the border region of these two countries. A single broad leaved specimen (Castellanos 20108 BA) from Jujuy in northern Argentina, somewhat distinct from L. scoparium, indicates more collections from this area are needed.

About 35 collections have been examined. The distribution is shown in Fig. 26.

10. LINUM OLIGOPHYLLUM Willd. ex Schult., Syst. 6: 758. 1820. Type: Willdenow Herb. 6233 (holotype: B). (Fig. 11).

Linum oligophyllum Willd. var. glandulosum Schiede, Linnaea 1: 62. 1826

Based on L. oligophyllum Willd.

Linum bipunctatum Bartl. ex Steud., Nom. Ed. II, 2: 51, 1841, nom. illegit.

Perennial glabrous herb, 6-40 cm tall; stems mostly upright, occasionally decumbent, branched at the base, along the stem and in the inflorescence; leaves 1-nerved, the larger 3-15 mm long, 0.5-3.0 mm wide, opposite below, alternate above, more or less spreading or the upper sometimes appressed, linear to lanceolate, acute to acuminate; stipular glands present; flowers frequently solitary and terminal but sometimes scattered in a more or less leafy paniculate inflorescence; sepals ovate, acuminate, 3-5 nerved, 3.2-4.3 mm long, margins denticulate, rarely entire, inner tip mostly glabrous; petals yellow, obovate, clawed, ca 7-12 mm long, the buds reddish without; stamens 4.0-5.5 mm long; staminodia short, deltoid or filiform; anthers elliptic, 0.5-1.0 mm long; styles free or briefly united at the base, 2.5-4.5 mm long; fruit broadly ovate, obtuse, 2.4-2.7 mm high, 3.0-3.4 mm in diameter, reddish brown on the upper surfaces; false septa ca 1/2 completed; seeds brown, subelliptic, 2.1-2.5 mm long.

The type of L. oligophyllum consists of three rather scanty specimens. There is no indication on the sheet as to locality, collector or date. They appear to represent a mixed collection. The left hand and center specimens are here taken as the holotype of L. oligophyllum. They bear stipular glands and agree with what we interpret as L. oligophyllum. The third plant, a fragment, lacks stipular glands and more closely resembles the plant we recognize as L. polygaloides. We include here figure 12, which shows more representative examples.

L. oligophyllum consists of a variable series of populations, the differences being mostly in habit, leaf size and, to a certain extent, style union. A rather widely collected plant, its range extends along both sides of the Andes Mts. from near Cuzco, Peru, northward to near Quito, Ecuador. It is found on rocky slopes in more or less open areas at elevations between 1800 and 3500 m. In the northern part of the range it may be confused with L. filiforme. The latter is a more slender plant, usually lacking stipular glands and possessing entire sepals. More collections are needed, however, from this part of South America to resolve the disposition of these two species. L. oligophyllum is also often confused with L. polygaloides where their ranges coincide in central Peru. The latter tends to have somewhat larger floral parts, particularly the styles, which are more than 5 mm long and united about 1/3 of the way or more, while in L. oligophyllum they are generally less than 5 mm and are separate or nearly so. There is no question, however, but that the two species are closely allied. L. oligophyllum, in fact, seems to be a transitional species between L. scoparium in the east, L. filiforme in the north, and L. polygaloides in the west.

About 50 collections of L. oligophyllum have been examined. The distribution is shown in Fig. 27.

11. LINUM FILIFORME Urb., Linnaea 41: 643. 1877. Type: Ruiz?, Peru? (photo of holotype: F). (Fig. 13).

Perennial glabrous herb, 19-50 cm tall; stems long, slender, branched at the base and simple or sparsely branched in the inflorescence; leaves 1-nerved, the larger ca 2.4-6.0 mm long, 0.5-1.6 mm wide, opposite or alternate, the upper reduced, appressed, linear or subulate; stipular glands mostly absent; flowers few, scattered, or more frequently solitary and terminal on inflorescence branches; sepals ovate, acuminate, 3-5-nerved, the larger 3.4-4.2 mm long, margins entire, inner tips glabrous; petals obovate, clawed, ca 9-10 mm long; stamens ca 4-5 mm long; staminodia small, deltoid or none; anthers elliptic, ca 0.5-0.9 mm long; styles separate, 3.4-4.1 mm long; fruit ovate, obtuse, reddish on the upper surfaces, 2.0-2.5 mm high, 2.2-3.0 mm in diameter; false septa ca 1/3 completed; seeds brown, sub-elliptic, ca 1.7-2.3 mm long.

The collector and place of origin of the type specimen are not known with certainty, although it was believed to have come from Peru of Bolivia and the name of Ruiz as collector was added later. The specimen was described in some detail by Urban when he named this species and there appears to be no question as to its status as the type, although it is now represented only by a photograph. Specimens which we have assigned to this species have come mostly from Ecuador. As noted under the discussion of L. oligophyllum, more collections from this part of South America are needed. As

circumscribed here, L. filiforme can usually be distinguished from L. oligophyllum, the only species with which its range overlaps, by the long slender stems and reduced leaves. The absence of stipular glands serves further to distinguish this from L. oligophyllum. However, some Ecuadorian plants with the same habit have quite well developed glands. They are included here, but may warrant formal recognition with further study.

About ten collections have been examined. The distribution is shown in Fig. 27.

12. LINUM PROSTRATUM Domb. ex Lam., Encyc. 3: 525. 1791.

Perennial or sometimes annual herb, 6-30 cm tall; stems upright to nearly procumbent, branched at the base and in the inflorescence; leaves 1-nerved, the larger 6-17 mm long, 1.8-5.1 mm wide, opposite below, alternate above, lanceolate, oblanceolate to narrowly obovate; stipular glands present; flowers very shortly pedicellate along spreading-ascending branches; sepals ovate, shortly acuminate, 3-5-nerved, entire or sparsely denticulate, inner tip pilose; petals lemon yellow, obovate, clawed, ca 5 mm long; stamens ca 3-4 mm long; staminodia small, deltoid or none; anthers elliptic, ca 0.6 mm long; styles free or very briefly connate at the base, ca 1.6-2.4 mm long; fruit broadly ovate, obtuse, 1.5-2.2 mm high, 1.9-2.7 mm in diameter; false septa ca $\frac{1}{2}$ completed; inner margins of true septa with some cilia; seeds brown, elliptic, 1.3-1.9 mm long.

L. prostratum is comprised of two varieties which may be distinguished as follows:

Perennial; ca 20-30 cm tall; leaves ca 11-17 mm long, ca 3-5 mm wide

L. prostratum var. prostratum

Predominantly annual; ca 6-10 cm tall; leaves ca 6-9 mm long, ca 2-3 mm wide

L. prostratum var. parvum

L. PROSTRATUM var. PROSTRATUM. Type: Dombey, in collibus siccis, Lima, Peru (holotype: P; probable isotypes: BM, K, P). (Fig. 14).

Linum paposanum Phil., Reise Wueste Atac. 13. 1860. Type: Philippi, Paposo, Chile (photo: F).

Var. prostratum has an intermittent range near the coast in southern Peru and northern Chile. Although several specimens have been examined from both Chile and Peru, definite localities have been identified only from near Paposo, Chile and Lima, Peru, separated by some 1500 km. The smaller floral parts distinguish this from L. oligophyllum and L. polygaloides, the ranges of which might overlap that of L. prostratum, while the separate styles additionally distinguish it from L. polygaloides. Near Paposo may also be found L. cremonophilum, but that species has a very different mat-like habit and styles which are united nearly to the summit.

L. prostratum var. prostratum is found in rocky, open areas mostly at elevations of less than 500 m. About 16 collections have been examined. The distribution is shown in Fig. 28.

L. PROSTRATUM var. PARVUM (Johnst.) Mildner. Type: Johnston 3549, hillside directly back of Mollendo, Dept. Arequipa, Peru, Oct. 16, 1925. (holotype: GH). (Fig. 15).

L. parvum Johnst., Contrib. Gray Herb. 85: 172. 1929.

Var. parvum is known from just two areas, near Lima and near Mollendo, Peru. Both are extremely dry places and the annual habit and small stature may both be related to the conditions imposed by this habitat. The variety is found at elevations of less than 300 m. In addition to the type specimen, four collections have been examined. The distribution is shown in Fig. 28.

13. LINUM POLYGALOIDES Planch., Hook. Lond. Jour. Bot. 7: 487. 1848. Type: Mathews 615, Cerro Pasco, Peru (lectotype: K). (Fig. 16). This collection has been generally considered to be the type. Three collections of this species on the sheet, a second of Mathews, from Purruchucha and another, Cuming 568, were all cited in the original description. The plant at lower left on the herbarium sheet is here interpreted to be the type.

Linum andicolum Krause Engl. Bot. Jahrb. 40: 278. 1908. Type: Weberbauer 2407, Tarma, Dept. Junin, Peru (photo: F).

Linum macraei Benth. f. peruviana Macbr., Field Mus. Pub. Bot. 13: 623. 1949. Type: Weberbauer 5812, Ocros, Ancash, Peru (F, GH, NY).

Perennial glabrous herb, 8-22 cm tall; stems with more or less spreading branches; leaves 1-nerved, the larger 11-17 mm long, 1.0-2.6 mm wide, opposite below but mostly alternate, sparsely pilose at the base, linear to lanceolate, acuminate; stipular glands present; flowers on pedicels up to ca 1 cm long, scattered in a more or less open leafy-bracted inflorescence; sepals ovate, acuminate, 3-5-nerved, the larger 3.8-4.2 mm long, margins denticulate or occasionally entire, inner tip glabrous or pilose; petals yellow, obovate, clawed, 10-14 mm long, buds reddish without; stamens ca 6.0-8.5 mm long; staminodia short, filiform; anthers narrowly elliptic, 0.7-1.4 mm long; styles united at least 1/3, 5.5-10.0 mm long; fruit broadly ovate, obtuse, 2.4-2.8 mm high, 2.9-3.5 mm in diameter, reddish brown on upper surfaces; false septa ca $\frac{1}{2}$ completed; seeds brown, subelliptic, ca 2.0-2.6 mm long.

L. polygaloides may be found in open places, rocky slopes at elevations of 1800-3700 m from central Peru, southward along the western slope of the Andes Mts. to near Arequipa in southern Peru. It is most often confused with L. oligophyllum with which it is very closely allied, but may usually be distinguished from it by the larger floral parts and the partially united styles. L. andicolum has been identified by photograph only and is placed here principally on the basis of the united styles it is said to have.

L. polygaloides provides a transition from the comparatively small flowered, separate-styled L. oligophyllum of Peru to L. ramosissimum and L. macraei, with larger flowers and, in the latter, united styles. The whole complex is rather a puzzling one and additional collections would be highly desirable. Plants here placed in L. ramosissimum differ principally in habit from L. polygaloides and it may well be that the whole disjunct series of populations could better be called L. ramosissimum. A single collection from Peru, called L. macraei f. peruviana, included here, differs from other material of L. polygaloides principally in having styles united almost to the summit. In this regard it resembles L. macraei too closely, but is disjunct from that species by more than 2000 km.

In addition to the type specimen, 22 collections have been examined. The distribution is shown in Fig. 27.

14. LINUM RAMOSISSIMUM Gay Flor. Chil. 1:463. 1845. Type: Gay 67, Prov. Coquimbo, Chile (holotype: F; ~~probably destroyed by fire and water, Fig. 27g, 27h.~~)

Linum obtusifolium Phil., Anal. Univ. Chile 82: 1105. 1893. Type: Philippi, Fray Jorge, Chile (photo: F).

Linum chamissonis Schiede var. obtusifolium (Phil.) Reiche, Anal. Univ. Chile 93: 841. 1896.

Linum chamissonis Schiede var. ramosissimum (Gay) Reiche, Anal. Univ. Chile 93: 841. 1896.

Perennial glabrous herb, 10-30 cm tall; stems angled, sometimes somewhat spreading, generally much branched, the branches stiffly subascending; leaves 1-nerved, the larger ca 9-22 mm long, 1.0-3.2 mm wide, mostly alternate, linear to narrowly lanceolate, acuminate, sometimes extending into the inflorescence; stipular glands present; flowers scattered in a more or less open few-flowered panicle; sepals ovate, acuminate, lanceolate, margins scarious, entire or sparsely denticulate, 3-5; rarely 7-nerved, 4.0-5.5 mm long, inner tip pilose; petals obovate, clawed, ca 12-14 mm long, the buds reddish without; stamens ca 6-9 mm long; staminodia small, filiform to deltoid, or none; anthers narrowly elliptic, ca 1 mm long; styles sometimes nearly free but usually united to about $\frac{1}{2}$ way, ca 4-6 mm long; fruit ovate, depressed, 2.3-2.5 mm high, 3.2-3.5 mm in diameter, reddish brown on the upper surfaces; false septa about $\frac{3}{4}$ completed; true septa with inner margins sparsely ciliate; seeds brown, elliptic, 2.1-2.4 mm long.

Although Gay's original description of L. ramosissimum did not include a collection number or specific locality, his number 67 from Coquimbo has been accepted as the type. Interpreted as such, L. ramosissimum is known from only a relatively small coastal area of Chile, centering in the Fray Jorge area near the Limari River, about 250 km north of Valparaiso. The species is very similar to L. polygaloides, which otherwise is found about 1500 km northwest in Peru. L. ramosissimum is rather more openly and stiffly branched and there are minor differences in flower size, but there is little question but that the two are closely allied. Further study may show that the two populations should be combined, in which case L. ramosissimum would be the prior name. We are at this point reluctant to combine the two, since material of L. ramosissimum, especially the type collection, is not very adequate. Additional material is needed, particularly from the vegetational "island" known as the Fray Jorge area. L. macraei also ranges northward into the range of L. ramosissimum. It may ordinarily be distinguished by its larger flowers and styles united nearly to the summit, but some collections appear intermediate. This large complex, which includes L. polygaloides, L. ramosissimum and L. macraei, as well as L. oligophyllum, L. filiforme, L. prostratum and L. chamissonis, extends intermittently from Ecuador to central Chile and is probably the most challenging in terms of species circumscription. The original description of L. obtusifolium notes the absence of stipular glands. Since no specimens lacking stipular glands have been seen from near the type locality of L. obtusifolium and since the remainder of the description and the photograph of the type fits L. ramosissimum very well, it appears safe to include it here. L. obtusifolium has been compared with L. chamissonis, which does lack these glands, but that species differs in other ways and as

now known, has a well-defined range several hundred km to the south.

In addition to the type specimen, about 9 other collections have been examined. The distribution is shown in Fig. 28.

15. *LINUM CREMNOPHILUM* Johnst. Contrib. Gray Herb. 85:62. 1929. Type: Johnston 5707, crevices at head of fog-bathed sea-cliffs near Aguada Cachina, Dept. Taltal, Chile, Dec. 15, 1929 (holotype: GH; isotype: K). (Fig. 18).

Perennial glabrous herb, ca 10-17 cm tall; stems mostly low, with spreading branches; leaves 1-nerved, the larger 4.5-7.5 mm long, 1.4-2.2 mm wide, opposite or alternate, lanceolate to ovate or obovate; stipular glands present; flowers solitary and terminal or scattered in a few-flowered paniculate inflorescence; sepals ovate, shortly acuminate, the larger 3.0-3.6 mm long, 3-5-nerved, entire; petals obovate, clawed, 9.5-10.0 mm long; stamens 6.8-7.0 mm long; staminodia small, deltoid or filiform; anthers elliptic, ca 1 mm long; styles united nearly to the summit, ca 8.0 mm long; fruit obtuse, 2.2-2.9 mm high, 2.6-3.2 mm in diameter; false septa ca $\frac{1}{2}$ completed; seeds light brown, subelliptic, ca 2 mm long.

L. cremnophilum is a very localized species on cliffs overlooking the sea near the Antofagasta-Atacama provincial boundary. Its mat-like growth makes it one of the most easily recognized of the South American species. The only other species of *Linum* known to grow near is *L. prostratum*, which is further distinguished by the essentially separate styles.

In addition to the type specimen the following collection has been seen: Johnston 5781, near Aguada Grande, Dept. Taltal, Dec. 16, 1925. The distribution is shown in Fig. 28.

16. *LINUM CHAMISSONIS* Schiede, Linnaea 1: 69. 1826. Type: Chamisso, slope near Biobio R., Chile (not seen). (Fig. 19). Chamisso's collection has not been located but the original description clearly refers to this distinctive species

Linum aquilinum β *grandiflorum* Hook. & Arn., Hook. Bot. Misc. III: 149. Type: Cuming 127. Concepción (CGE,K).

Linum oligophyllum Hook. & Arn. non Willd., Bot. Beech. Voy.:11. 1841. (type not seen).

Linum macraei Benth. var. *cumingii* Urb., Linnaea 41: 626. 1877. This variety was meant to be based upon *L. cumingii* of Loddiges. That species is, however, best assigned to *L. macraei*, while this variety, represented by Cuming 127 (CGE,K), is *L. chamissonis*.

Perennial glabrous herb, ca 6-50 cm tall, simple or branched from the woody base as well as in the inflorescence; leaves 1-nerved, the larger 8-25 mm long, 1.5-3.0 mm wide, opposite below alternate above, often imbricate, linear to lanceolate or the lower broader; stipular glands absent; inflorescence few-flowered, racemose or paniculate, flowers often clustered near ends of branches; sepals lanceolate to ovate, sharply acuminate, 3-5-nerved, 4.6-6.0 mm long, the margins glandular-denticulate, inner tip pilose; petals yellow-orange, broadly obovate, clawed, 14.0-15.8 mm long; buds reddish without; stamens 9.5-12.0 mm long; staminodia short, filiform to deltoid; anthers narrowly elliptic, 1.1-1.5 mm long; styles free or very briefly united, ca 11-13 mm long; fruit broadly ovate, obtuse, 2.6-3.0 mm high, 2.8-3.5 mm in diameter; false septa about $\frac{1}{2}$ completed; true septa with inner margins sparsely ciliate; seeds brown, subelliptic, 2.2-2.8 mm long.

L. chamissonis is the southernmost species of Linum in South America, being restricted to the region about Concepción and southward to about the 39th parallel near Temuco in south-central Chile, where it is found in sandy to loamy soil on hills and slopes. The only species with which its range overlaps is L. macraei from which it is easily distinguished by the separate styles and absence of stipular glands. It is one of the most distinctive of South American species.

About 40 collections have been examined. The distribution is shown in Fig. 29.

17. LINUM MACRAEI Nenth. Edward's Bot. Reg. 16: sub t. 1326. 1830.

Perennial glabrous or puberulent herb, ca 7-60 cm tall; stems simple or mostly branched at the base, along the stems and in the inflorescence, often compact; leaves 1-nerved, the larger 5-20 mm long, 0.8-3.5 mm wide, opposite below, alternate above, often imbricate, linear to lanceolate; stipular glands present, sometimes on the sepals as well; flowers solitary and terminal or in few-flowered clusters, sometimes scattered; sepals lanceolate to ovate, sharply acuminate, 3-5-nerved, 4.5-7.0 mm long, entire or sparsely denticulate, inner tip mostly pilose; petals yellow, obovate, clawed, ca 15-21 mm long, buds orange-red without; stamens 10.0-13.5 mm long; staminodia narrowly deltoid or sometimes none; anthers narrowly elliptic, 1.1-2.2 mm long; styles united nearly to the summit in the southern part of range, somewhat less so in the northern part, ca 11-15 mm long; fruit broadly ovate, obtuse, 2.6-3.0 mm high, 3.3-3.7 mm in diameter, reddish brown on upper surfaces; false septa ca 1/3 completed; true septa with occasional cilia at the inner margins; seeds dark brown, narrowly elliptic, ca 2.5-3.0 mm long.

Two more or less intergrading varieties may be recognized.

Stems glabrous; sepals mostly without stipular glands; habit more or less open

L. macraei var. macraei

Stems puberulent; sepals with stipular glands; habit low and compact

L. macraei var. marticorenae

L. MACRAEI var. MACRAEI. Type: McRae, Valparaíso, Chile, 1825 (holotype: K; isotype: G). (Fig. 20). The original description is of a plant without data other than "gathered at Valparaíso by Mr. McRae, collector to the Horticultural Society". The 1825 McRae collection is accepted as the type.

Linum cumingii Lodd. Bot. Cab. 20: t. 1996. 1833.

No Cuming collection was cited but an illustration seems clearly to be this variety. See L. macraei var. marticorenae for further discussion of this name.

Mesynium chilense Raf., Fl. Tell. 3: 33. 1836. Based on L. macraei.

Linum chironioides Griseb., Abh. Wiss. GÖtt. 6: 118. 1854. Type: Philippi 398, Valparaíso, Chile (isotypes: BM, G, LE, P).

Linum macraei Benth. var. oligophyllum (Hook. and Arn. non Willd.) Reiche, Flora de Chile 1: 343. 1896 (type not seen). This is an example of how errors of interpretation can become compounded. L. oligophyllum Willd. is a Peruvian plant. Hooker and Arnott misassigned that name to L. chamissonis known only from Chile. Reiche used Hooker and Arnott's oligophyllum as the basis for his variety of macraei, but based on the localities cited for it, it must be L. macraei var. macraei.

Var. macraei is found on dry, rocky and sandy slopes near the coast from about 250 km north to about 250 km south of Valparaíso. In the northern part of the range some collections more or less merge with L. ramosissimum although it tends to have more nearly united styles and larger floral parts.

In the southern part its range overlaps that of L. chamissonis but is easily distinguished from that species by its united styles and the presence of stipular glands.

Partly because of its large, showy flowers, var. macraei is the most commonly collected taxon in the genus in South America. In addition to the type, ca 90 collections have been examined. The distribution is shown in Fig. 29.

L. MACRAEI var. MARTICORENAE Mildner, *Phytologia* 23: 439. 1972. Type: Mildner 15a, roadcut, ca 23 km from Concepción, near Curapalhue, Chile, Dec., 1969 (holotype: US; isotypes: CONC,K,UC,WUD). (Fig. 21).

The assignment of a new varietal name to this, a somewhat more compact, puberulent form of L. macraei, may clarify its nomenclatural status. From Urban's description of L. macraei var. cumingii (Linnaea 41: 626. 1877) it seems that he had this plant in mind. The principal and name giving collection which he cites, Cuming 127, is, however, uniformly L. chamissonis. Loddiges' original description of L. cumingii did not cite a collection number but merely said it was introduced in 1830 by Mr. Cuming. The illustration accompanying his original description appears to be L. macraei var. macraei and thus L. cumingii becomes a synonym for that species.

L. macraei var. marticorenae is found from the Valparaíso area southward to Concepción. It shares the upper half of its range with var. macraei and overlaps the northern part of the range of L. chamissonis. Often confused with the two, it can be separated by the puberulent stems, the low compact habit and imbricate leaves. The connate styles and stipular glands also distinguish it very readily from L. chamissonis.

Var. marticorenae is found on dry soil, on wooded slopes and open areas up to about 400 meters. About 25 collections have been examined. The distribution is shown in Fig. 29.

18. LINUM CRATERICOLA Elias., *Bot. Notiser* 121: 634. 1968. Type: Eliasson 905, small crater north-east of Floreana Peak, Floreana, Galapagos, Dec. 16, 1966 (holotype: S). (Fig. 22).

Glabrous perennial, semi-shrubby herb, 40-50 cm tall; branches numerous, ascending; leaves 1-nerved, 7.5-11 mm long, 1.0-1.3 mm wide, alternate, narrowly lanceolate; stipular glands none; inflorescence of rather stiffly ascending-spreading, few-flowered branches; sepals ovate, acuminate, with prominent midnerve, 3-3.5 mm long; petals obovate, 8 mm long, alternating with diminutive staminodia; styles separate, ca 3 mm long; fruit broadly ovate, ca 3 mm high, 2.5 mm in diameter; seeds brown, subelliptical, ca 1.6 mm long.

L. cratericola is clearly related to L. oligophyllum and L. filiforme of mainland South America. From the former it differs in the lack of stipular glands; from the latter it differs in the more ample inflorescence of stiffly spreading-ascending branches. It is easily distinguished from L. harlingii, the only other species of Linum in the Galapagos Islands, by its lack of stipular glands.

L. cratericola is known only from the type and two additional collections from crater margins on the same island.

19. LINUM HARLINGII Elias., Bot. Notiser 121: 636. 1968. Type: Harling 5367, Volcan Darwin, Isabella, Galapagos, June 7, 1959 (holotype: S). (Fig. 23).

Glabrous semishrub, 30-60 cm tall, with numerous suberect branches; leaves 1-nerved, mostly 5-10 mm long, 1.0-1.2 mm wide, alternate, narrowly lanceolate, with prominent stipular glands; inflorescence much branched, flowers mostly terminal; sepals ovate, acute, with prominent midnerve, 2.9-3.3 mm long, with basal glands; petals obovate, ca 10 mm long; stamens 3-4 mm long, alternating with diminutive staminodia; styles separate, 5-6 mm long; fruit ovate, ca 3 mm high and 2.5 mm in diameter; seeds brown, elliptic, ca 1.7 mm long.

L. harlingii, like L. cratericola, is most closely related to L. oligophyllum and L. filiforme of the South American mainland. It is a larger shrubbier, more bushy branched plant than either, especially the latter. The strongly developed stipular and sepalar glands easily distinguish this from L. cratericola the only other species known from the Galapagos Islands.

L. harlingii is known only from the type collection and one other collection, both Volcán Darwin on Isabela Island.

Doubtful Taxa

1. Linum aquilinum Mol., Sagg. Chil. : 150. 1782. There are a number of peaks and mountains known as Aquila, from whence this was supposed to have come. The name has generally been applied to L. macraei, but the meager description could fit more than one species and it is necessary to relegate it to the doubtful taxa. If its identity should become known, the name has priority over all others in Chile.

2. Linum chilense Kostl., Allg. Med.-Pharm. Flora 5: 1912. 1836. This was cited without exact location from Chile. The extremely meager description suggests that this plant may not be Linum.

3. Linum erectum Larr., Escritos D. A. Larrañaga 2: 123. 1923. This plant is not sufficiently well described to identify which of several Uruguayan species it might be. It may well be the cultivated L. usitatissimum L.

4. Linum oligophyllum Willd. var. eglandulosum Schiede, Linnaea 1: 68. 1826. Based upon an unidentified Sello collection from Buenos Aires, this could be any one of several species.

DISCUSSION

While there almost certainly are too few good collections yet available and there is genetical and other experimentation which must be done before a complete assessment of relationships of the South American species to each other and to the species of section Linastrum elsewhere can be made, there is a general picture which has emerged.

Examination of the worldwide distribution of Linum reveals that the center of diversity and possible center of origin lie in the Mediterranean region, the only area in which representatives of all five of the commonly recognized sections may be found. This suggests that the Old World plants

of section Linastrum may be ancestral to the American plants. Studies of the North American species of section Linastrum (Rogers, 1963, 1968, 1969) have shown that the species on that continent which are thought to be the most primitive are located in east-central Mexico. They resemble closely certain plants of southern Africa. For example in both North America and southern Africa are found two types of plants, probably not too distantly related from one another, but differing rather strikingly in habit. There are those which have broad leaves, frequently in whorls, and with a more or less leafy inflorescence, and those with narrow opposite leaves with an open inflorescence. All are perennial, with ovate, pointed, freely dehiscent fruits which have only partially developed false septa, separate styles, stipular glands and yellow petals. In Africa the broad-leaved type is represented by L. quadrifolium, in Mexico by L. schiedeanum. The narrow-leaved type is represented by L. holstii in Africa, L. rupestre in Mexico.

In South America these same two types may be found. The broad-leaved L. smithii has opposite leaves only, but its habit and most other morphological traits resemble those of L. quadrifolium and L. schiedeanum. The narrow-leaved type is represented by L. burkartii which, while lacking stipular glands, is very similar to L. rupestre and L. holstii. So close in appearance is it to the former that the two might well be considered conspecific if they were geographically near. The chromosome complements of the two are known to be $2n=36$ as well.

The composite range of L. burkartii and L. smithii includes eastern Argentina, Uruguay and southern Brazil (Fig. 24). This Atlantic coastal region proves to be the center of greatest diversity of the genus in South America, with nine of the twenty-two taxa being found there. It may indicate that this is the area of introduction to the continent and is in support of the idea that the South American plants are closely allied to the plants of southern Africa.

The comparison of South American species for a series of characters including habit, longevity, sepal margin and texture, fruit shape, degree of development of the false septa, union of styles, petal pigmentation, pollen morphology and, in some species, chromosome number, reveals that L. smithii and L. burkartii are among the least specialized. These plants may serve as a reasonable starting point from which to advance a general theory about the course of evolutionary development and geographical migration among the South American species of the genus.

On the basis of general similarities, plus what appear to be transitional collections, all of the South American species seem to be more closely allied with L. smithii than with L. burkartii although it must be said that this assumption is not on the firmest of ground without support from many more collections. L. organense, from the Organ Mts. of eastern Brazil, is a more leafy plant than L. smithii, without stipular glands and with a reduced inflorescence, but the two, which in the past have not been separated taxonomically, are clearly closely related. L. littorale, L. brevifolium and L. palustre comprise a closely related complex, differing from one another mainly in habit, with the last two possessing specialized, reduced inflorescences. They have a number of features in common with L. smithii, with L. littorale var. oblongifolium being most similar in habit. The most widespread and diverse of the complex is L. littorale, which includes a tetraploid population in the northern part of the range and plants which tend

to merge with L. scoparium in the south. L. carneum and L. erigeroides of Uruguay, Argentina and southern Brazil are most similar to L. scoparium, from which they differ mainly in habit and fruit shape.

L. scoparium has a range which extends from Uruguay and eastern Argentina, where its similarity to L. carneum and L. littorale has been noted, northward to western Bolivia within a few kilometers of the Peruvian border. At that point the chief difference between it and collections of L. oligophyllum from eastern Peru is the absence of stipular glands. L. oligophyllum extends along both slopes of the Andes in Peru and marks the region, in terms of present day distributions, where the genus crosses this mountain range.

At the northeastern part of the range of L. oligophyllum, L. filiforme may be distinguished, which differs mainly in habit. More collections are clearly needed from that area in order to resolve the question as to whether more than one species exists there.

Southward from Peru as far as south-central Chile, is a principal migratory route. Plants with generally more of the brick-red pigments in the corolla, more nearly united styles and larger floral parts are found along this route, beginning in the north with plants such as L. prostratum and including L. polygaloides, L. cremnophilum, L. ramosissimum, L. chamissonis and culminating with L. macraei. Linum macraei and L. cremnophilum, on the western coast of Chile, must be considered the most highly evolved of the genus in South America. It must be emphasized, however, that, notwithstanding a considerable degree of total diversity among the South American species, they are as a whole very much more uniform than the North American segment of the section. Species differences in several instances are not very profound and what can be interpreted as plants intermediate between adjacent species are common.

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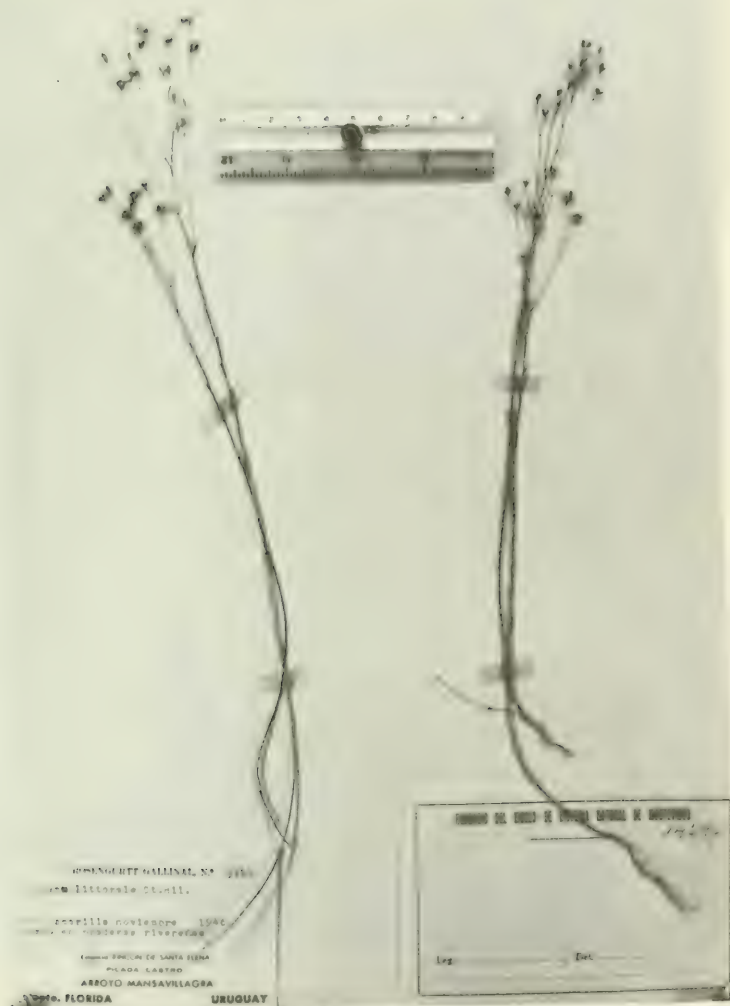


Figure 1. Linum burkartii Mildner. Isotype MVM.



Figure 2. Linum organense Gardn. Holotype K.



Figure 3. Linum smithii Mildner. Holotype UC.



Figure 4. Linum littorale St. Hil. var. littorale.
Isotype P. Inset of a flower from a representative plant.

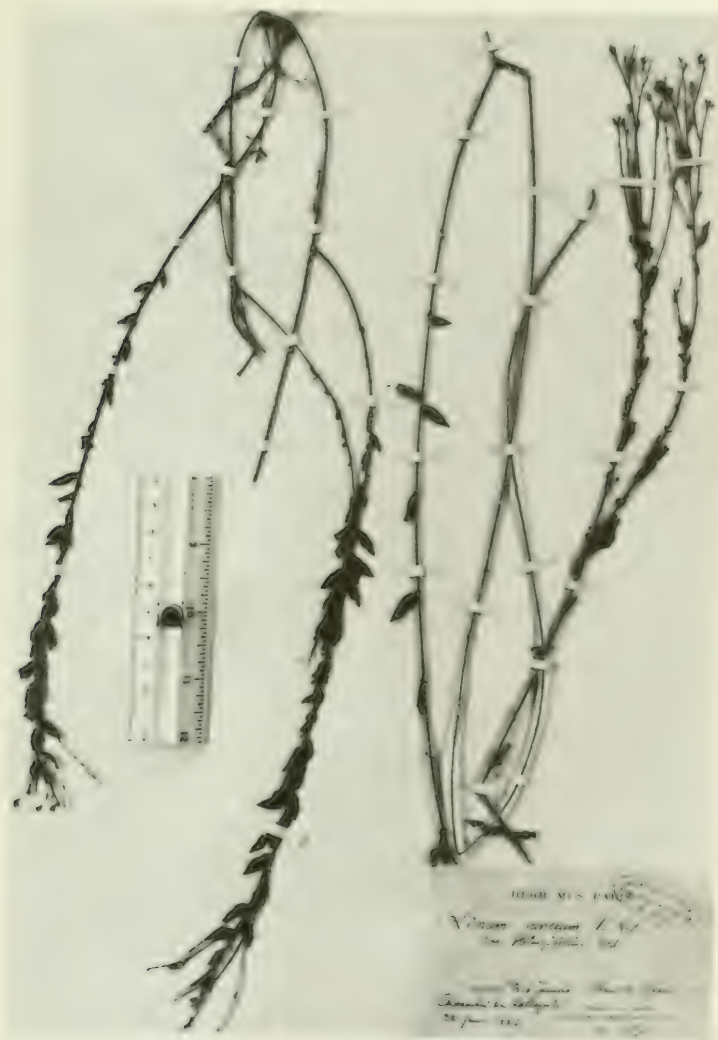


Figure 5. Linum littorale St. Hil. var. oblongifolium (Urb.) Rogers. Representative specimen.



Figure 6. Linum brevifolium St. Hil. Holotype P.

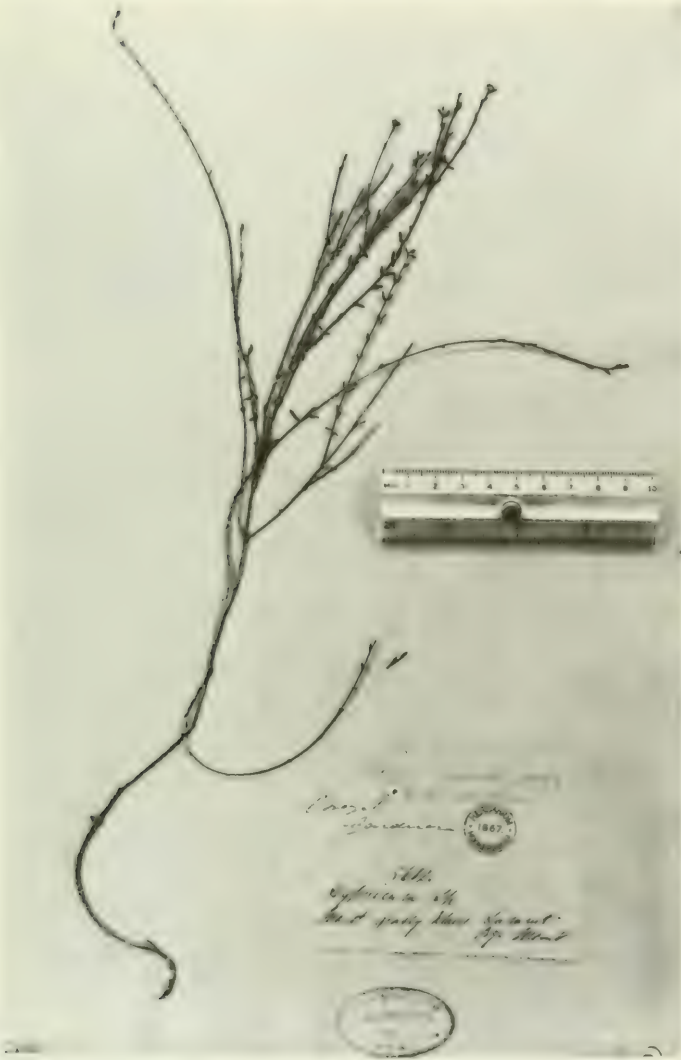


Figure 7. Linum palustre Gardn. Holotype K.



Figure 8. Linum carneum St. Hil. Isotype P.
Typical fruit, enlarged.



Figure 9. Linum erigeroides St. Hil.
Representative specimen.

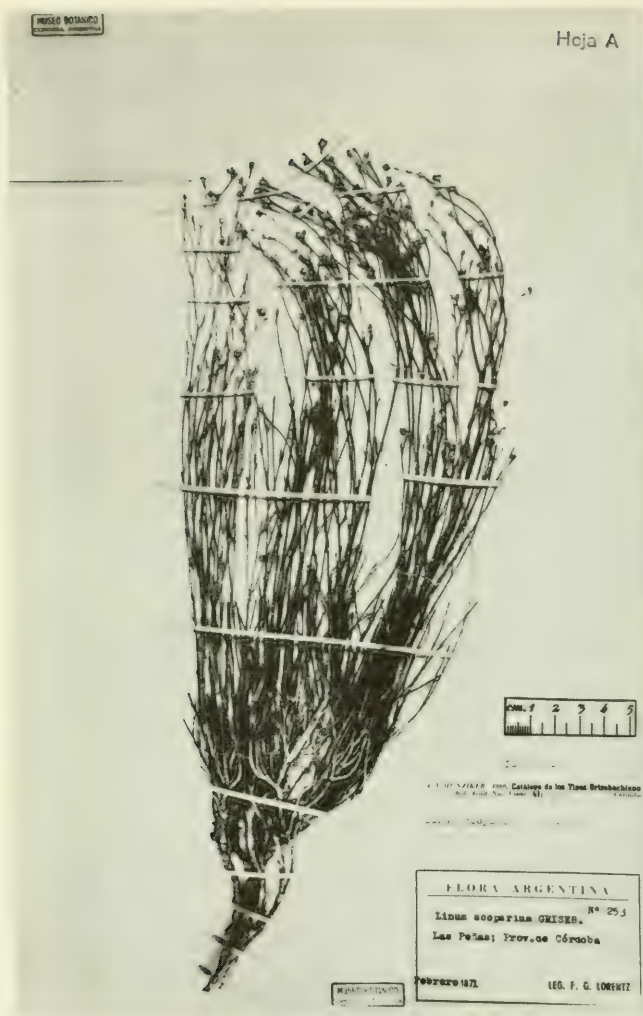


Figure 10. Linum scoparium Griseb. Isotype CORD.



Figure 11. Linum oligophyllum Willd. Holotype B.



Figure 12. Linum oligophyllum Willd.
Representative specimen.



TYPES OF THE BERLIN HERBARIUM

Rockefeller Foundation Fund for Photographing Type Specimens

13011 *Linum filiforme*
B. C. ...

PHOTOGRAPHED BY
FIELD MUSEUM OF NATURAL HISTORY

Figure 13. Linum filiforme Urb. Photo of holotype B.



Figure 14. *Linum prostratum* Dombey ex Lam.
var. prostratum. Holotype P.



Figure 15. Linum prostratum Dombey ex Lam. var. parvum (Johnston) Mildner. Holotype GH.



Figure 16. Linum polygaloides Planch. Lectotype K.



HERB. MUS. PARIS

Linum ramosissimum Gay.

18014

Figure 17. Linum ramosissimum Gay. Photo, probable isotype B.



Figure 18. Linum cremnophilum Johnston. Isotype K.



Figure 19. Linum chamissonis Schiede.
Representative specimen.

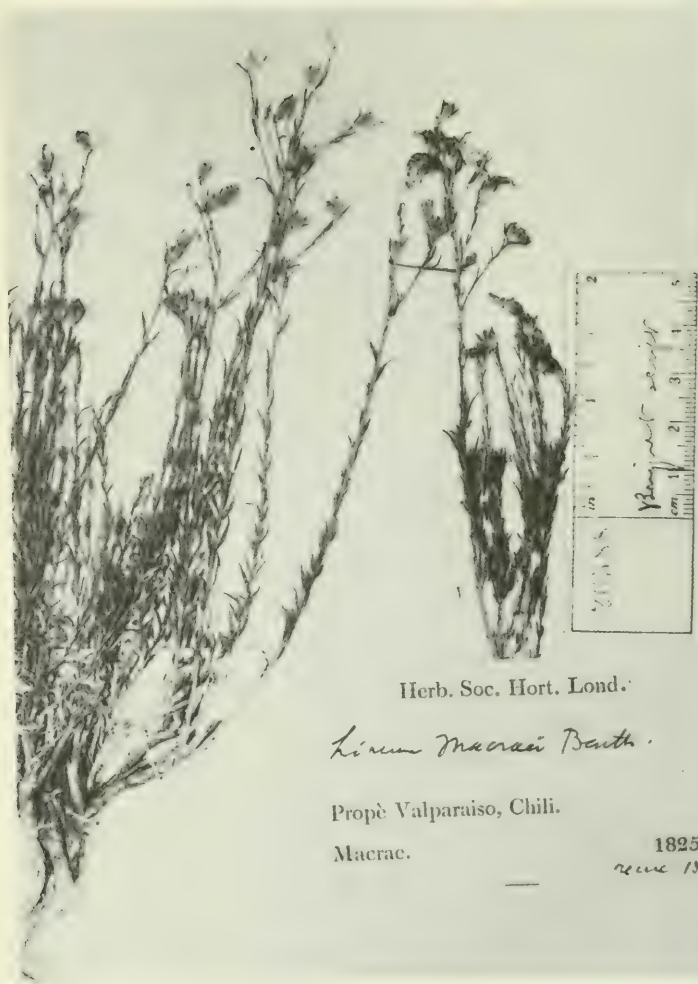


Figure 20. Linum macraei Benth. var. macraei Holotype K.



Figure 21. Linum macraei Benth. var. marticorenae Mildner. Holotype US.

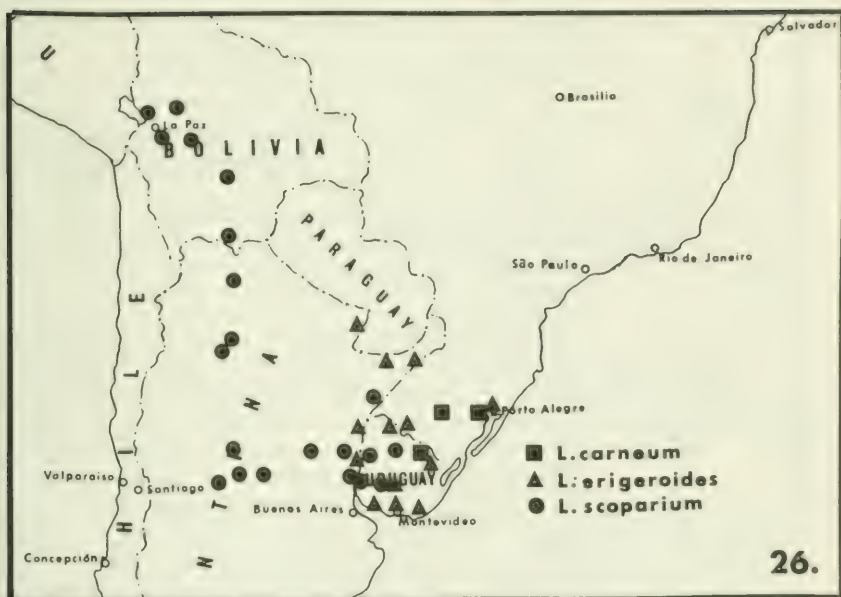


Figure 22. Linum cratericola Elias. Holotype S.



Figure 23. Linum harlingii Elias. Holotype S.







ADDITIONAL NOTES ON THE GENUS LIPPIA. X

Harold N. Moldenke

LIPPIA PALMERI S. Wats.

Additional bibliography: Moldenke, Phytologia 39: 266--267. 1978.

Moran & Reveal refer to this species as "occasional". On the other hand, Dress and his associates call it "abundant". It has been found growing at 10--600 m. altitude, flowering from September to December and February to May, fruiting in February, November, and December.

The corollas are said to have been "white" on Moran 20085 and on Moran & Reveal 20085, "yellow" on Hastings & Turner 69-34, "pinkish" on Moran 4068, "pale-lavender" on Carter & Moran 4381 and Wiggins 15399, "lavender to white, turning pink" on Wiggins 14432, "pale-lavender to white, pink in age" on Wiggins 14443, and "pale-yellow, later turning brown" on Stevens 1519.

The Carter, Alexander, & Kellogg 2476 and Kenoyer 2482, distributed as typical L. palmeri, seem better regarded as var. spicata Rose, while Kaiser s.n. is Aloysia sonorensis Moldenke and M. E. Jones 23237 is Lantana hispida H.B.K. (not L. scorta Moldenke as previously reported).

Additional citations: MEXICO: Baja California: Carter & Ferris 4044 (Au--271014, N); Carter & Moran 5381 (N, Sd--68623); Hastings & Turner 64-272 (Sd--61247, Tu--158345); R. Moran 20085 (W--2796937); Moran & Reveal 20085 (Sd--92458); D. M. Porter 122 (Au--216377, Tu--148902); I. L. Wiggins 5539, in part (Se--22095, Se--220927, Tu--177030), 14432 (Au--190210, Se--208912, Tu--169785), 14443 (Au--190212, Se--208910), 14610 (Tu--169464), 15399 (Tu--180992), 15461 (Au--200406, Tu--177533), 15588 (Se--208882); Wiggins, Carter, & Ernst 319 (W--2522114); Wiggins & Ernst 576 (W--2522166). Sonora: Astorga, Edmundson, Moser, & Felger 17030 (Sd--92082); Dress, Moser, Moser, & Felger 20523 (Sd--92152); Gentry 4685 (Tu--98600); Hastings & Turner 64-54 (Tu--151726), 69-34 (Tu--172001), 72-56 (Tu--184701); Shantz & McGinnies 39 (Tu--12779); W. D. Stevens 1519 (Ld). GULF OF CALIFORNIA ISLANDS: Carmen: R. V. Moran 9138 (Sd--66197). Coronado: R. V. Moran 9096 (Bl--240139, Sd--66198). Monserrate: R. V. Moran 9297 (N, Sd--66195, W--2571594A). San José: R. V. Moran 9410 (Sd--66194). San Marcos: R. V. Moran 8966 (Sd--66196). Tiburon: R. V. Moran 4068 (Ba, Sd--50248); F. Torres s.n. [Marzo de 1962] (Ip, Ip). Turners: R. V. Moran 13035 (Sd--63034).

LIPPIA PALMERI var. SPICATA Rose

Additional bibliography: Moldenke, Phytologia 14: 412. 1967; Moldenke 391

denke, *Résumé Suppl.* 17: 2. 1968; Moldenke, *Fifth Summ.* 1: 72 & 77 (1971) and 2: 563 & 893. 1971.

Recent collectors describe this plant as a perennial with many slender branches, to 1.5 m. tall, and have found it growing along washes, at the dry edges of paved highways, and in broad arroyos of *Larrea* and *Krameria* with scattered *Pachycereus*, at 25 m. altitude, flowering in January, March, and April. Wiggins speaks of the "flowers in small stout spikes", Moran found it "occasional along arroyos". The corollas are said to have been "lavender-white to deep lavender-rose" on *Carter & al.* 2476.

It is very likely that this taxon should be reduced to mere form rank.

Additional citations: MEXICO: Baja California: *Carter, Alexander, & Kellogg* 2476 (Sd—44573, Se—175979); *I. L. Wiggins* 5539, in part (Au—238407), 14614 (Au—190211, Se—208911). GULF OF CALIFORNIA ISLANDS: Tiburon: *R. V. Moran* 8743 (Sd—66199).

LIPPIA PEARSONI Moldenke

Additional bibliography: Friedrich-Holzhammer in *Merxm., Meeuse, & Meikle*, *Prodr. Südw. Afr.* 122: 8. 1967; Moldenke, *Phytologia* 14: 413. 1967; Moldenke, *Résumé Suppl.* 15: 21. 1967; Moldenke, *Fifth Summ.* 1: 244 (1971) and 2: 563 & 893. 1971; Moldenke, *Phytologia* 39: 105. 1978.

Recent collectors describe this plant as a succulent bush or shrub, 0.8—1.5 m. tall, strongly aromatic, with small flowers, and have found it growing "in rocky conditions", flowering in January and May, at 1800 feet altitude. Bayliss refers to it as "local". Borges encountered it "junta a uma linha de água". The corollas are said to have been "white" on *Bayliss* BS.4161, *Borges* 182, and *Kuntze* s.n. [12/3/94].

Friedrich-Holzhammer (1967) distinguishes *L. pearsoni* from *L. wilmsii* as follows: *L. pearsoni* -- "Jüngere Stengelsteile und Blätter nur spärlich mit sehr kurzen anliegenden Haaren bedeckt und ausserdem stark drüsig; Blätter ganzrandig bis sehr schwach und undeutlich gesägt. Köpfchen meist zu 4—6 an den Stengelknoten, bis ca. 15 mm lang gestielt, kugelig bis eiförmig, meist unter 10 mm lang. Tragblätter breit eiförmig, kurz zugespitzt, bis ca. 3 mm lang."

L. wilmsii -- "Jüngere Stengelsteile und Blätter ziemlich dicht mit längeren, abstehenden, steifen Haaren bedeckt, ausserdem drüsig. Blätter deutlich gesägt. Köpfchen meist zu 2—4 an den Stengelknoten, ca. 20—50 mm lang gestielt, eiförmig-länglich, ca. 10—15 mm lang. Tragblätter schmal-eiförmig, lang zugespitzt."

He reduces *L. volkii* Moldenke to synonymy under *L. pearsoni*, while the Pretoria botanists reduce it to *L. wilmsii* H. H. W. Pearson. He records the vernacular name, "kao", and cites *De Winter & Leistner* 5285 & 5526 and *Volk* s.n. -- all of which collections I still regard as *L. volkii* Moldenke.

Material of *L. pearsoni* has been misidentified and distributed

in some herbaria as L. asperifolia Rich., L. javanica (Burm. f.) Spreng., and Lantana salvifolia Jacq.

Additional citations: AMGOLA: Huila: Borges 182 (Mu). Mossamedes: E. J. Mendes 61 (Z). SOUTH AFRICA: Cape Province: Bayliss BS.4161 (Bm, N, W--2564393). Natal: Kuntze s.n. [Kranz Kloof, 12/3/94] (N).

LIPPIA PEARSONI var. **SESSILIS** Moldenke, *Phytologia* 12: 343. 1965.

Additional bibliography: Moldenke, *Phytologia* 14: 413. 1967; Moldenke, *Résumé Suppl.* 15: 21. 1967; Moldenke, *Fifth Summ.* 1: 244 (1971) and 2: 563 & 893. 1971.

LIPPIA PEDUNCULATA H. H. W. Pearson

Additional bibliography: Moldenke, *Phytologia* 13: 364. 1966; Moldenke, *Fifth Summ.* 1: 257 (1971) and 2: 893. 1971.

The Meebold 12829, distributed as L. pedunculata, actually is L. wilmsii H. H. W. Pearson.

LIPPIA PEDUNCULOSA Hayek

Additional bibliography: Moldenke, *Phytologia* 12: 344--345, 1965; Moldenke, *Fifth Summ.* 1: 156 (1971) and 2: 563 & 893. 1971.

LIPPIA PENDULA Rusby

Additional bibliography: R. C. Foster, *Contrib. Gray Herb.* 184: 170. 1958; Angely, *Fl. Anal. Paran.*, ed. 1, 576. 1965; Moldenke, *Phytologia* 13: 364. 1966; Moldenke, *Fifth Summ.* 1: 156 & 183 (1971) and 2: 893. 1971; Troncoso, *Darwiniana* 18: 337 & 410. 1974.

Anderson and his associates found this plant "sprawling in semi-open part of forest, in area of gallery forest and adjoining 'campo sujo'", at an altitude of 1350 m., flowering in February. The corollas on their collection is said to have been "white with yellow eye".

Additional citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35183 (Ld, N, W--2709299).

LIPPIA PETIOLATA Moldenke, *Phytologia* 28: 192--193. 1974.

Bibliography: Moldenke, *Phytologia* 28: 192--193 & 439 (1974) and 39: 162. 1978.

Irwin and his associates describe this plant as an ascending subshrub, to 30 cm. tall, the corollas lavender-purple, the tube yellow and eventually red-violet, and encountered it in campos and gallery forest margins, at 1250 m. altitude, flowering and fruiting in February, and their collection was misidentified and distributed as L. lacunosa Mart. & Schau.

Citations: BRAZIL: Minas Gerais: Irwin, Maxwell, & Wasshausen 20509 (Ac--isotype, N--type).

LIPPIA PHAEOCEPHALA Briq.

Additional & amended bibliography: Briq. in Chod. & Hassl., *Pl. Hassler.* 2: 494--495. 1904; Burkart, *Excerpt. Bot. A.5:* 586. 1962;

Moldenke, Phytologia 12: 346—347. 1965; Moldenke, Fifth Summ. 1: 186 & 189 (1971) and 2: 893. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

LIPPIA PHRYXOCALYX Briq.

Additional bibliography: Burkart, Excerpt. Bot. A.5: 586. 1962; Moldenke, Phytologia 13: 364. 1966; Moldenke, Fifth Summ. 1: 156 & 186 (1971) and 2: 893. 1971; Troncoso, Darwiniana 18: 339 & 410. 1974; Moldenke, Phytologia 39: 164—165. 1978.

Troncoso (1961, 1974) makes this the type species of a Section *Pseudoaloysia* Troncoso, which she characterizes as "Cabezuelas subespiciformes laxas, breves, alargándose después de la antesis, axilares, de inserción supra-axilar. Brácteas lanceoladas, coloradas. Flores brevemente pediceladas. Arbustos."

The Eitens describe the species as a shrub, 2 m. tall, with light-violet flowers, and found it in bloom "on mountainsides with vegetation apparently true caatinga", flowering in July.

Material has been misidentified and distributed in some herbaria as *L. lasiocalycina* var. *sainthilairei* Moldenke, which it closely resembles.

Additional citations: BRAZIL: Piauí: Eiten & Eiten 4506 (N), 4914 (N).

LIPPIA PLICATA J. G. Baker

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 278 & 281. 1900; Moldenke, Phytologia 14: 413. 1967; Richards & Morony, Check List Fl. Mbala 238. 1969; Teixeira, Bol. Soc. Brot. 44, ser. 2, xi. 1970; Moldenke, Fifth Summ. 1: 230, 237, 244, 246, & 250 (1971) and 2: 549, 566, & 893. 1971; Moldenke, Phytologia 31: 388. 1975.

Recent collectors describe this plant as an aromatic many-stemmed herb, bush, subshrub, or shrub, 0.8—1.8 m. tall, with rough leaves and small flowers, and have found it growing on steppes, open sandy grassy spaces, sandy soil of low bush country, at the edge of water, among tall or rough grasses, and at the edges of *Brachystegia* woodland in low-lying ground, at altitudes of 800—2200 m., flowering in February, April, May, and October. The corollas are said to have been "white" on Moreno 159, 232, 278, & 386 and on Tyrer 916 and "whitish" on Reekmans 1193, while Abercorn says "flowers white, yellow stem red" (whatever that may mean! Tyrer describes its distribution as "occasional", while Moreno found it "abundant in black soil near rivers", used medicinally "para fazer chá para se dores do peito", and reports the common name "ondembi").

Baker (1900) distinguishes this species from the other species known to him from tropical Africa as follows:

1. Bracts orbicular, obtuse.

2. Peduncles very short. L. oatesii.

2a. Peduncles long. L. radula.

1a. Bracts cuspidate.

3. Leaves small.

4. Leaves orbicular or obovate.....L. somalensis.4a. Leaves oblong, rugose.....L. javanica.3a. Leaves larger, oblong or oblong-lanceolate, scarcely rugose.....L. abyssinica.

1b. Bracts acuminate.

5. Leaves opposite.....L. ukambensis.5a. Leaves ternate.....L. burtonii.1c. Bracts acute.....L. plicata.

He cites only Carson 81 from "British Central Africa". Richards & Morony (1969) cite Richards 214, 737, 1093, 1632, 15039, & 22251 from Mbala. They also list Richards 9603 as "Lippia sp. or hybrid indet. near L. plicata Bak. (?L. javanica ex plicata)" from rough ground at Kawimbe, 5800 feet altitude.

Material of L. plicata has been distributed in some herbaria as Lantana rugosa Thunb., Lantana sp., and Labiatae. On the other hand, the Quarré 2960, distributed as typical L. plicata, seems better placed as var. parvifolia (Moldenke) Moldenke.

Additional citations: ZAIRE: Liben 1433 (Mu). BURUNDI: Reekmans 1193 (E--2209164, E--2209181). ANGOLA: Huambo: Moreno 159 (Mu), 232 (Mu), 278 (Mu), 386 (Mu). Province undetermined: Burger s.n. [Sandando] (Mu). ZAMBIA: Abercorn 22251 (E--1873221). MALAWI: Tyrer 916 (N).

LIPPIA PLICATA var. ACUMINATA (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 14: 413. 1967; Moldenke, Fifth Summ. 1: 230, 244, & 252 (1971) and 2: 566 & 893. 1971.

Additional citations: MOZAMBIQUE: Niassa: Rui Monteiro 35 (Z).

LIPPIA PLICATA var. PARVIFOLIA (Moldenke) Moldenke

Additional bibliography: Moldenke, Phytologia 14: 413. 1967; Moldenke, Fifth Summ. 1: 230 (1971) and 2: 566 & 893. 1971.

Material of this variety has been distributed in some herbaria as typical L. plicata J. G. Baker or as L. strobiliformis Moldenke.

Additional citations: ZAIRE: Quarré 2960 (N).

LIPPIA POHLIANA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 414. 1967; Moldenke, Fifth Summ. 1: 156 (1971) and 2: 560 & 892. 1971; Moldenke, Phytologia 31: 385. 1975; Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 39: 78 & 259. 1978.

Recent collectors describe this plant as an erect brittle shrub or subshrub, 0.7--1 m. tall, with many stems from an underground xylopodium, and found it growing in rocky cerrado, on "outcrops in areas of cerrado with outcrops bordering gallery forest".

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"TRANSPORT IN PLANTS I Phloem Transport" edited by M. H. Zimmermann & J. A. Millburn, xviii & 535 pp., 93 b/w fig. Springer-Verlag, Berlin, Heidelberg, & New York, N. Y. 10010. 1975. \$64.80.

This carefully prepared and experimentally oriented text is also Volume I of the "Encyclopedia of Plant Physiology, New Series". It replaces Ruhland's Handbook or Encyclopedia series of 1955-1967. According to its editors, A. Pirson and M. H. Zimmermann, "subject matter of larger individual fields will be covered in several volumes, each one however self-contained and complete in itself. Thus the first volume.....[is] a set of three, covering transport and exchange phenomena at three levels of organization: the [long distance in] whole plant, tissue and cells, and structures within cells."

Twenty contributors treat the most recent information on the solute substances in phloem and exudates and the still unsettled problem of mechanisms of phloem transport — Münch osmotic pressure-flow, electroosmosis, micro-electro-kinesis, etc.

"TRANSPORT IN PLANTS II Part A - Cells" edited by U. Lüttge & M. G. Pitman, xvi & 400 & xix pp., 97 fig. & 64 tab. as b/w illus. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 10010. 1976. \$52.50.

This work highlights the active and passive transport across the cell membranes and their regulation by such internal factors as pH and ions. It is also Volume II Part A of the "Encyclopedia of Plant Physiology, New Series". Fourteen contributors have their papers grouped as (1) theoretical and biophysical approaches including water relations, membrane transport and fluxes, and electrical properties, (2) particular algal, fungal and storage tissues, and (3) carbon metabolism, including energy problems and negative feedback.

"TRANSPORT IN PLANTS II Part B - Tissues and Organs" edited by U. Lüttge & M. G. Pitman, xii & 456 & xix pp., 129 fig., & 47 tab. as b/w illus. Springer-Verlag, Berlin, Heidelberg, & New York, N. Y. 10010. 1976. \$56.60.

This fine work is also Volume II Part B of the "Encyclopedia of Plant Physiology, New Series" and not only has its own index, as all units in this series do, but it also includes Part A and its

conclusions are more regularly and effectively expressed than in Part A. Fourteen contributors provide papers on (1) pathways of transport in apoplasmic (cell walls and intercellular spaces, mainly a diffusion path) and in symplastic (membranes and plasmodesmata, mainly an efficient ionization route) parts of tissues, (2) transport processes in tissues in roots and leaves including secretory glands, and (3) regulation and integration into whole plants.

"TRANSPORT IN PLANTS III Intracellular Interactions and Transport Processes" edited by C. R. Stocking & U. Heber, xxiii & 517 pp. & 123 b/w fig. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 10010. 1976. \$59.50.

This text is Volume III in the "Encyclopedia of Plant Physiology, New Series" and its emphasis is on "the importance of interactions among various cellular compartments" and the "critical evaluations of current experimental results and theories in this field [which] should be of service both to students and to research workers". The first section deals with membrane isolation, various membrane compositions and models. The second section considers each major cellular organelle (nuclei, cytoplasm including enucleated, chloroplasts and other plastids, DNA, mitochondria, Golgi apparatus, endoplasmic reticulum, etc.). The next sections deal with energy conservation and mass transport across membranes explained with nonequilibrium thermodynamics.

This study garners the best in relevant thinking and experimenting on these topics to date. It is a needed orientation for continuing studies.

"PHYSIOLOGICAL PLANT PATHOLOGY" edited by R. Heitefuss & P. H. Williams, xx & 890 pp., 92 b/w figs. Springer-Verlag, Berlin, Heidelberg & New York, N. Y. 10010. 1976. \$79.60.

This very detailed treatment is presented as Volume IV of the "Encyclopedia of Plant Physiology, New Series". Each paper in each of these books ends with a detailed pertinent bibliography yielding a large total of well organized reference sources. This book also includes a list of phytopathogens which produce phytotoxic compounds and a separate index of other microorganisms and nematodes considered in the text.

There are 36 contributors whose research accounts deal mainly with host-pathogen interactions, regulation of spore germination, cytology of virus transport and infection, physiology of penetration and establishment, forces by which pathogens attack their hosts and host response and predisposition. All these volumes are valuable for advanced students and researchers, but are so expensive.

"INSECT POLLINATION OF CULTIVATED CROP PLANTS. Agriculture Handbook No. 496" by S. E. McGregor, viii & 411 pp., 196 b/w fig. diag. & photos. U. S. Government Printing Office, Washington, D. C. 20402. 1976. \$5.90 paperbound.

This effectively and directly explained text "is directed primarily to the grower who wants to achieve the highest possible economic production of those crops that are benefited by insect pollination. It should also be a useful reference book for specialists [and students] in agronomy, apiculture, entomology, and horticulture, and of special interest to beekeepers who supply bees to growers for pollination purposes". For 151 crops and a few variants from acerola to zigzag clover are given scientific name and family, 1972 USDA figures on economic importance of the crop, plant inflorescence description relating to pollination, pollination requirements, agents, practice recommendations and references. Also provided are introductory chapters explaining the economics of plant pollination, beekeeping in relation to pollination and pesticides, etc. Except for a slip — "fertilize a stigma" — on p. 236, there is a wealth of carefully checked information in this valuable book.

"PORTRAIT OF NATURE - The World As Seen by Modern Science" by Sir Alan Cottrell, 236 pp. & 54 b/w line diag. Charles Scribner's Sons, Inc., New York, N. Y. 10017. 1975. \$9.95.

It is probably well remembered by many that the author served for years as the Chief Scientific Adviser to the Crown and the British Government. In this book for the general non-scientific reader he continues his well-honed lucid and accurate descriptions and explanations so as "to look through the dense jungle of technical scaffolding at the breathtaking structure that is beginning to take shape behind it, the portrait of nature as seen by science". Excellent reading!

"THE YEAR OF THE KOALA" by H. D. Williamson, xv & 209 pp., 1 map & 13 plates as b/w illus. Scribner's Sons, Inc., New York, N. Y. 10017. 1975. \$8.95.

With similar high quality of charming writing and accurate observation as evidenced in Fisher's "The Year of the Whale" and Ordish's "The Year of the Butterfly", this book follows a group of koalas in New South Wales with monthly reports. With the removal of eucalypt forests to provide more farms, ranches and settlers' homes, the plight of these gentle creatures is becoming serious.

Introducing each chapter there is a full page attractive drawing by William T. Cooper depicting an incident described in the text. This book, as well as the entire series, should have wide reader appeal.

"PERENNIALS FOR YOUR GARDEN" by Alan Bloom, 1¼ pp., 275 color & 8 b/w photos & 8 line diag. as illus. Charles Scribner's Sons, Inc., New York, N. Y. 10017. 1975. \$8.95.

This horticulturist-author of deserved worldwide fame has in his 5-acre Dell Garden over 5,000 kinds of thriving hardy perennial plants. For one or more species, varieties or cultivars of 120 genera from *Acanthus* through *Zantedeschia* beautiful color illustrations and culture notes are given, making this book a really attractive, valuable, and practical guide for the home or professional gardener and a visual delight for the armchair gardener.

"ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS. Volume 7" edited by Richard F. Johnston with Peter W. Frank & Charles D. Michener, vii & 540 pp., 32 fig. & 17 tab. as b/w illus. Annual Reviews, Inc., Palo Alto, California 94306. 1976. \$17.00.

This is a valuable member in a valuable series in the valuable Annual Review publications which have contributed so much of importance and interest since their yearly publication was initiated. This volume 7 "concerns aspects of direct organismal correlation with environmental heterogeneity" with sets of models for population dynamics, with spatial diversity influencing basic population phenomena and trophic biology, etc. Janzen's "Why Bamboos Wait So Long to Flower" is particularly interesting reading.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY. Volume 27" edited by Winslow R. Briggs with Paul B. Green & Russell L. Jones, viii & 581 pp., 45 fig. & 10 tab. as b/w illus. Annual Reviews Inc., Palo Alto, California 94306. 1976. \$17.00, \$17.50 foreign.

The prefatory well-reasoned article is by van Overbeek on the world food supply since "growing the plants to feed the rising tide of population has become the world's most pressing agricultural, social, political and moral problem....and [since] a breakthrough is needed in the creation of new food plants capable of producing more and higher quality food with less supplementary energy input". He hopes that we can soon "imitate photosynthesis.....[by] splitting of water with the visible rays of the sun's energy". Twenty-one other fine papers deal with such topics as intracellular transport, bioenergetics, mobilization of storage proteins in seeds, development of fleshy fruits, hormone building in plants, geotropism, root hormones, phytolectins, etc.

As in all of the "Annual Reviews" there are detailed author and subject indexes and the announcement of the availability of individual articles as reprints for one dollar each.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY. Volume 28" edited to Winslow R. Briggs with Paul B. Green & Russell L. Jones, viii & 615 pp., 58 b/w fig. & 12 b/w tab. Annual Reviews, Inc., Palo Alto, California 94306. 1977. \$17.00 U.S.A., \$17.50 foreign.

As should be expected, there is much of value in this volume of 21 papers starting with E. Bünning's prefatory chapter entitled "Fifty Years of Research in the Wake of Wilhelm Pfeffer" which provides an excellent contrast of the author's German philosophically oriented university training and teaching since the 1920s with the experimental approach of France, Great Britain and the U.S.A., an insight into postwar revival of botanical institutions and universities and a reminder of the many scientific advances initiated or foreseen by his mentor, Dr. Pfeffer. The other papers deal with modern studies in such fields as: ion and mitochondrial-metabolite and auxin-polar transport, photosynthetic cytochromes and phytochrome control of enzymes from membranes as possible sites of primary action, seed dormancy maintained by lack of integration of interlocking metabolic systems whose principal components, ATP and pyridine nucleotide, along with mitochondria, etioplasts and glyoxysomes, can initiate germination.

These studies provide an effective means for keeping abreast of the advances in plant physiology.

"WALLACE AND NATURAL SELECTION" by H. Lewis McKinney, xix & 193 pp., 10 b/w fig. Yale University Press, London & New Haven, Connecticut 06520. 1972. \$12.50.

Alfred Russel Wallace "was unencumbered by strong religious ties or orthodox scientific dogmas". On the basis mainly of his explorations with Bates in South America and his study in the Moluccas he was able to write in 1858 "while I was thinking over the possible mode of the origin of new species, that somehow my thoughts turned to the 'positive checks' [disease, famine, accidents, war, etc.] to increase among savages and others described.. by Malthus....and in the case of wild animals these checks would act with much severity...., there suddenly flashed upon me the idea of the survival of the fittest — that those individuals which every year were removed by these causes — termed collectively the 'struggle for existence' — must on the average and in the long run be inferior in some one or more ways to those which manage to survive."

"So deeply impressed was I with the importance of this theory, that the very same evening I sketched the outlines, and in the two succeeding evenings wrote it out in full, and sent it by the next post to Mr. Darwin."

Historian McKinney has provided herein a valuable evaluation of Wallace's studies, his contemporaries and the beginning of evolutionary biology.

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NEW SPECIES OF SYAGRUS FROM THE STATE OF BAHIA (BRAZIL),
WITH A REVISIONAL STUDY OF CLOSELY RELATED TAXA*

S. F. Glassman

Professor of Biological Sciences, University of Illinois,
Chicago Circle and Research Associate in Palms, Field Museum
of Natural History.

Recent collections in 1974 and 1977 from Bahia by Ray Harley and Simon Mayo of Kew Gardens have revealed the discovery of an interesting new species in the palm genus *Syagrus* (fig. 7). At first glance, the specimens (collected near Mucugé) strongly resemble *S. werdermannii*, an acaulescent, endemic confined to the Caetité area, about 150 km southeast of Mucugé. A comparative study of the gross morphology and leaf anatomy, however, indicates a distinct, new species.

Syagrus harleyi Glassman, sp. nov. Palma acaulis. Folia aequaliter pinnatisecta petiolo non dentato rachidi 93-136 cm longa pinnis utrimque 25. Spathae pars inflata 34-51 cm longa 2.5-3 cm lata. Spadix pars ramosa 17-21 cm longa rachillae 17-22, 6-12 cm longae. Flores masculi 4-5 mm longi; flores feminei 4.5-6 mm alti 4.5-5 mm lati. Fructus 1.5-2.5 cm longus 1.1-2.5 cm diam.

Acaulescent palm. Petiole 33 cm long and 1 cm wide, margins smooth or fibrous, sheathing base 25-30 cm long; leaf rachis 93-136 cm long, pinnae 25 pairs per leaf, middle ones more or less evenly spaced, not clustered, 43 cm long and 2.5 cm wide, mostly with asymmetrical tips, dark green above, glaucous below; expanded part of spathe 34-51 cm long and 2.5-3 cm wide, deeply plicate-sulcate, more or less glabrous, peduncular part 45-62 cm long; branched part of spadix 17-21 cm long, rachillae 17-22 in number, 6-12 cm long, peduncular part 62 cm long; male flowers 5 mm long on lower part, 4 mm on upper part; female flowers rounded, 4.5-6 mm long, 4.5-5 mm in diam, calyx and corolla more or less nerved, about equal in size; fruits 8-10 per rachilla, immature ones ovoid, 1.5 cm long and 1.1 cm in diam, covered with brown tomentum, persistent perianth 0.5 cm high, usually one-seeded, occasionally with two seeds, seeds 6-7 mm long, 5 mm in diam, mature fruits orange, 2.5 cm long, 2.5 cm in diam, endocarp cavity trivittate, endocarp bony, 1-2 mm thick.

Specimens examined: Brazil, Bahia Serra do Sincorá, by Rio Cumbuca ca 3 km S. of Mucugé, riverside, damp sandy soil,

* This work has been supported by National Science Foundation Grant BMS 7509779.

sandstone rocks and partly burnt over vegetation, alt. 850 m., Feb. 4, 1974, Harley et al. 15963 (K, holotype; BH,F,MO,NY,US, isotypes); Bahia, south of Andaraí, 16 km along road to Mucugé, near small town of Xique-Xique, sandstone rocks intersected by small streams, alt. 700-900 m, Feb. 14, 1977, Harley et al. 18696 (K).

Vernacular names: none recorded.

Distribution: Brazil state of Bahia, common along road between Mucugé and Andaraí, approx. 41°19'W, 12°54'S, along streams in sandy soil and sandstone rocks, a conspicuous element in the "campo rupestre" vegetation.

As previously mentioned, the new species seems to be most closely related to S. werdermannii. In fact, Bondar (1964) thought that he had observed S. werdermannii in Mucugé, but he probably saw S. harleyi. The new taxon apparently belongs to a group of species with a similar leaf anatomy pattern e.g., S. vagans, S. ruschiana and S. schizophylla, (Glassman, 1972a) as well as S. microphylla (Glassman, 1977) and S. werdermannii (see figs. 1-6). These illustrations show that the adaxial nonvascular fibers occur as very common, elongate clusters; whereas, on the abaxial side they appear as much smaller, spherical clusters which are only about one-half as common as the adaxial fibers. Of the six taxa, S. harleyi is the most distinctive, i.e., the clusters of adaxial nonvascular fibers are unequal in size, thicker, and not as common as the others.

Even though this group of species if linked by a unique leaf anatomy pattern (for Syagrus), they can be easily distinguished morphologically, for the most part. In fact, one of the species, S. schizophylla, is usually placed in another genus (Arikuryroba) because of its spiny petioles and ruminate endosperm. The following key differentiates the taxa:

1. Plants mostly acaulescent, pinnae 0.8-2.5 cm wide.
2. Petiole margins sparsely spiny on basal third, smooth or fibrous on upper two-thirds, expanded part of spathe 85-106 cm long and 8 cm wide, peduncular part of spadix 107 cm long, branched part 55-60 cm long, rachillae 42-45 in number S. vagans
2. Petiole margins smooth or merely fibrous throughout, expanded part of spathe 13-48 cm long and 2-5 cm wide, peduncular part of spadix 17-72 cm long, branched part 9-40 cm long, rachillae 4-18 in number.
3. Plants mostly prostrate, middle pinnae consistently in tight clusters of 2-3, 10-22 cm long, peduncular

part of spadix 17-31 cm long, rachillae 4-6 in number S. microphylla

3. Plants mostly upright, middle pinnae not clustered or occasionally clustered, 43-45 cm long, peduncular part of spadix 62-72 cm long, rachillae 11-22 in number.

4. Leaf rachis 93-136 cm long, middle pinnae 2.0-2.5 cm wide, not clustered, branched part of spadix 17 cm long, rachillae 17-22 in number, each 6-12 cm long S. harleyi

4. Leaf rachis 50-59 cm long, middle pinnae 1-2 cm wide, single or occasionally in clusters of 2-3, branched part of spadix 30-40 cm long, rachillae 11-14 in number, each 22-25 cm long S. werdermannii

1. Plants aborescent, trunks 2-8 m tall, pinnae 3.5-4 cm wide.

4. Trunks 2-4 m tall, petiole margins densely spiny, endosperm of seed ruminant S. schizophylla

4. Trunks 4-8 m tall, petiole margins smooth or merely fibrous, endosperm of seed homogeneous . . S. ruschiana

Besides their similar leaf anatomy pattern, the six species under consideration also have the following morphological characteristics in common: spathes plicate-sulcate, female flowers 4-8 mm long and 3-7 mm in diam, male flowers 2-6 mm long above, 4-9 mm long below, and pinnae 0.8-4.0 cm wide with oblique, asymmetrical tips.

The above species of Syagrus occur mostly in Bahia, but a few are also found in the adjacent states of Espírito Santo, Minas Gerais and Pernambuco. Apparently, none have overlapping ranges since most of the taxa have limited distributions. Syagrus vagans is very common in caatingas between Brumado and Lagedo Alto in east-central Bahia (figs. 15-17); S. werdermannii is endemic to caatingas in the Caetité area in Central Bahia; S. harleyi is confined to sandy soil or sandstone rocks near streams in a small area between Mucugé and Andaraí; S. microphylla is endemic to caatingas in the Morro de Chapéu area; S. schizophylla is found mainly on sandy soil in Atlantic coastal areas from southeastern Bahia to Pernambuco (figs. 11-14); and S. ruschiana is endemic to black gneissic rocks in limited areas of Espírito Santo and adjacent Minas Gerais (figs. 8-10).

I have considered placing all six taxa in a separate section of the genus Syagrus; but this realignment, as well as others,

will be deferred until a thorough revision of Syagrus and allied genera is completed. A number of knotty problems must be resolved, however, before such a revision is realized. In a previous paper (Glassman, 1970), I placed S. ruschiana with S. botryophora (Mart.) Mart. in section Syagropsis; and S. vagans and S. schizophylla in section Butia with five other species which I have since transferred to the genus Butia (Glassman, in press).

In order to clarify their relationship, a detailed taxonomic treatment of each of the five remaining species (S. ruschiana, S. schizophylla, S. vagans, S. werdermannii and S. microphylla) is given below.

Syagrus ruschiana (Bondar) Glassman, Rhodora 65:261. 1963;
Cocos ruschiana Bondar, Bol. Inst. Centr. Fom. Econ. Bahia 9:45. figs. 10-13. 1941. Arikuryroba ruschiana (Bondar) Toledo, Arq. Bot. São Paulo 2:6. 1944.
Lectotype: Brazil, Espírito Santo, Colatina and S. Mateus, 1941, Bondar s.n. (F-620822). c.f. Glassman 1972b, p. 94.

Trunk 4-8 m tall, 4-12 cm in diam, often forming clumps. Petiole 90-103 cm long, about 1.5 cm wide near base, margins fibrous or smooth, not spiny, sheathing base 30-36 cm long; leaf rachis 163-200 cm long, 50-57 pairs of pinnae per leaf, not clustered, middle ones 50-53 cm long, 2.4-3.5 cm wide, with asymmetrical tips, usually glaucous on both surfaces, becoming eglaucous with age, expanded part of spathe 100-110 cm long, 5-6 cm wide and 1 mm thick, more or less brittle in texture, deeply plicate-sulcate, slightly whitish-brown tomentose to glaucous, peduncular part 68-70 cm long; branched part of spadix 90-98 cm long, rachillae 80-100 in number, 50-55 cm long, peduncular part 70-74 cm long; male flowers 8-9 mm long on lower part, 3-6 mm long on upper part, sepals irregular in size and shape, 0.5-2.5 mm long; female flowers rounded or ovoid 3.5-6 mm long, 3-5 mm in diam, petals and sepals distinctly striated; mature fruit 2.5 cm long, 2.0 cm in diam, with very short beak, endocarp cavity trivittate, smooth, endocarp 1-2 mm thick; seed 1.4 cm long and 1.3 cm in diam, endosperm homogenous.

Specimens examined: Brazil (see lectotype above); Espírito Santo, 1946, Bondar s.n. (F-404604-5); 13 km E. of Colatina (5 km W. of Baunelha), confined to black gneissic rocks, associated with columnar cacti, about 100 trees seen, July 10, 1969, Glassman & Costa 8743 (CHI); Minas Gerais, Rodovia Nanuque-Teófilo Otoni, serra rochosa, Aug. 14, 1965, Belem 1628 (BH,UB). Doubtful. Espírito Santo, Rio Pancos, Colatina, Dec. 8, 1943, J. G. Kuhlmann s.n. (RB-62960)-without leaves.

Vernacular names: Colatina, Coco de pedra.

Distribution: native to Brazil in restricted areas of Espírito Santo and adjacent Minas Gerais, apparently confined to black gneissic rocks.

No specimens were cited by Bondar in his original article (1941), therefore his earliest collection was designated as the lectotype. Bondar originally described S. ruschiana as having seeds with ruminant endosperm which later prompted Toledo (1944) to transfer this species to the genus Arikuryroba. Unquestionably, Bondar was in error because the endosperm is homogeneous. Even though this taxon has homogeneous endosperm and smooth petiole margins, it seems to be most closely related to S. schizophylla (with ruminant endosperm and spiny petiole margins) because other morphological characters are similar and the leaf anatomy pattern in both species is almost identical.

Bondar (1964) gave the following locality data for S. ruschiana: in gneissic rocks on the banks of Rio Doce in Colatina, and in the município of São Mateus, about 1000 m alt. During my trip to Brazil in 1969, I was unable to find this palm in the above localities, but only in the area cited previously by me (about 5 km W. of Baunilha).

Syagrus schizophylla (Martius) Glassman, Fieldiana Bot. 31: 386. 1968; Cocos schizophylla Martius, Fl. Bras. 2:119. t. 85. 1826; Arikury schizophylla (Martius) Beccari, L'Agric. Colon. 10:455. 1916; Arikuryoba schizophylla (Martius) Bailey, Gentes Herb. 2:196. 1930.
Lectotype: Brazil, Bahia, Martius 1924 (M). c.f. Dahlgren 1959, pl. 7.
Arikuryroba capanemae Barb. Rodr., Pl. Nov. Cult. Jard. Bot. Rio. de Jan. 1:6, t.3, fig. 1, 1891; Sert. Palm. Bras. 1:t. 90A. 1903; Cocos capanemae (Barb. Rodr.) Drude, Engler & Prantl Pflanzenfam. Nachtr. 1:57. 1897; Cocos arikuryroba Barb. Rodr., Palm. Mattogross. Nov. 25, 1899.
Lectotype: Brazil, Bahia (Barbosa Rodrigues 1891, t.3, fig. 1). c.f. Glassman 1972 b, p. 13.

Trunk 2-4 m tall, frequently in clumps, sometimes flowering when acaulescent. Petiole 90-100 cm long, 4 cm wide at base, margins armed short, curved teeth (often irregularly spaced) for most of its length, teeth longer toward base (5mm), becoming shorter toward apex (1-2 mm); sheathing base 19-21 cm long, with fibrous and coarsely spiny margins; leaf rachis 135-145 cm long, 40-43 pairs of pinnae per leaf, not clustered, often widely spaced, middle ones 56-59 cm long, 2.5-4.0 cm wide, with strongly oblique and asymmetrical tips, the margins of tips fre-

quently laciniate, mostly glabrous on both surfaces; expanded part of spathe 65-70 cm long, 5-6 cm wide, deeply plicate-sulcate; branched part of spadix 55-60 cm long, rachillae 28-32 in number, 26-28 cm long, peduncular part 65-71 cm long; male flowers 5-7 mm long on lower part, 3-5 mm long on upper part, sepals about 1 mm long; female flowers rounded or ovoid, 4.5-8 mm long, 3-6 mm in diam, sepals mostly with hooded, imbricate tips; mature fruit 2.5-3.0 cm long, 2.2-2.5 cm in diam, with short beak, endocarp cavity trivittate, smooth, endocarp 1-3 mm thick; seed 1.7 cm long, 1.4 cm in diam, endosperm ruminate.

Specimens examined: Brazil, Pernambuco, Cabo de Santo Agutinho, D.A. Lima s.n. (IPA-53-1655); Porto de Galinhas Estação Experimental de Litoral Ipa, Paulo Ferreira s.n. (IPA-67-35); in restinga, Glassman & Costa 8708 (CHI). Bahia, Martius 1924 (M), lectotype of Cocos schizophylla; Martius 1853 (P); Blanchet 4 (G); Blanchet 40 (P); Salvador, Bondar s.n. (F-404610, 620750, 6119774); between Amaralina and Pituba, Dahlgren s.n. (F-620690); Ilheus, H.M. Curran 437 (F); Porto Seguro, A.P. Duarte 5977 (RB); Pituba, suburb of Salvador, in clumps along beach, coconut grove, Glassman & Costa 8721, 8722 (CHI); 7 km S. of Ilheus, along sandy beach, Glassman & Costa 8741 (CHI). Cultivated: Brazil, W. Accorsi s.n. (SP-51.563), Dahlgren s.n. (F-611536); British Guiana, Dahlgren s.n. (F-610650); Cuba, Jack 4482 (A); Florida, Dahlgren 50/052 (F). Vernacular Names: Aricury, Ariry Guriri, Nicury, Aricury-roba, Nicuryroba.

Distribution: Native to Brazil in the states of Pernambuco and Bahia, mostly limited to sandy soil close to the Atlantic coastal areas.

Even though S. schizophylla is so distinct morphologically (spiny petiole margins and seeds with ruminate endosperm) that it is recognized as a separate genus by many authors, this taxon appears to be closely related to a group of species (S. ruschiana, S. vagans, S. werdermannii, S. harleyi and S. microphylla) with a strikingly similar leaf anatomy pattern.

Syagrus schizophylla is known to cross with S. coronata (where their ranges overlap in coastal Bahia to produce the hybrid, S. x tostana (Bondar) Glassman. This hybrid is apparently rare because it is known from only a few collections.

Syagrus vagans (Bondar) Hawkes, Arq. Bot. S. Paulo 2:178. 1952.
Cocos vagans Bondar, Field Mus. Nat. Hist. Bot. 22:457. 1942.

Lectotype: Brazil, Bahia, Bondar s.n. (F-619777). c.f.

Glassman 1972b, p. 95.

Acaulescent, usually growing in clumps. Petiole 76-80 cm long, about 1.5 cm wide near base, margins armed with short teeth for at least the lower third of its length, sometimes edentate; sheathing base 30-32 cm long, margins fibrous intermixed with short teeth; leaf rachis 100-110 cm long, 34-36 prs. of pinnae per leaf, in loose clusters of two, or single, usually glaucous on both surfaces, middle ones 50-54 cm long, 2.0-2.5 cm wide, mostly with oblique, asymmetrical tips; expanded part of spathe 85-106 cm long, 8 cm wide, deeply plicate-sulcate, brownish tomentose or glaucous, peduncular part 100-107 cm long; branched part of spadix 60-65 cm long, rachillae 42-46 in number, 41-43 cm long, peduncular part 105-107 cm long; male flowers 4-7 mm long on lower part, 3-4 mm long on upper part; female flowers rounded, 5-7 mm long, 5-7 mm in diam, sepals slightly shorter than petals in older flowers; fruit elliptical-ovoid, 2.8-3.7 cm long, 1.5-1.8 cm in diam, beak 2-3 mm long, endocarp woody, 1-2 mm thick along sides; locule one, seed angular or round in cross section, 1.9-2.4 cm long, 0.8-1 cm in diam, endosperm homogeneous.

Specimens examined: Brazil, Bahia (see lectotype above); Santa Teresinha, Bondar s.n. (F-619778, 620715, 620752); Bondar 1559 (SP); 30 km N. of Jequié, para Milagres, Belém & Mendes 242 (BH); 20 km N. of Lagedo Alto, caatinga, common, Glassman & Costa 8709 (CHI); 5-10 km W. of Lagedo Alto, caatinga, abundant, Glassman & Costa 8710, 8711, 8712, 8713 (CHI); 20 km N. of Maracás, Morros, in caatinga, very local or sparse, Glassman & Costa 8717, 8718, 8719 (CHI); 22 km E. of Brumado, caatinga, about 50 clumps seen, Glassman & Costa 8725, 8726 (CHI). Cultivated. Florida, Fairchild Tropical Garden, Moore 7715, 8965, 9372 (BH); Read 9372 (BH, FAIR).

Vernacular names: Ariri, Licurioba

Distribution: Brazil, confined to caatingas in the east-central part of Bahia, from Lagedo Alto and Santa Teresinha on the north and east, Jequié to the south, and southwest to Brumado; associated with Syagrus coronata (Mart.) Becc. over much of its range, and hybridizes with it near Lagedo Alto to produce Syagrus x matafome (Bondar) Glassman.

In his 1942 article, Bondar cited all specimens for each new species described (four species of Cocos and four species of Attalea) as isotypes deposited in the Field Museum. From this information it was assumed that at least one other set of specimens existed in Brazil. After a number of inquiries and searching over a period of years, however, I have been unable to locate any other sets of specimens for the taxa described in the above article. Therefore, I have designated all specimens called isotypes by Bondar (1942) as lectotypes.

Syagrus vagans seems to be most closely related to S. schizophylla because of the similarity in size and shape of both male and female flowers, spiny petiole margins and an almost identical leaf anatomy pattern; but it can easily be distinguished by its acaulescent habit, narrower pinnae, smaller and sparser spines on the petiole margins, and the homogeneous endosperm. As mentioned earlier, the ranges of these two taxa apparently do not overlap; S. vagans grows in caatingas, whereas S. schizophylla is found mainly in sandy soil along beaches.

Syagrus werdermannii Burret, Fedde Rep. 32:109. 1933; Notizbl. 13:682. 1937; Glassman, Fieldiana Bot. 34:1-10, figs., 1-9. 1971.

Holotype: Brazil, Bahia, Caetité (Werdermann 3472-B, destroyed); Neotype: 15 km N.W. of Caetité (Glassman & Costa 8728-CHI). c.f. Glassman, 1971, p. 7.

Acaulescent, growing in clumps. Petiole 34-36 cm long, 1 cm wide, margins smooth or fibrous, sheathing base about 20 cm long; leaf rachis 56-60 cm long, pinnae 18-20 pairs per leaf, middle ones single or occasionally in clusters of 2-3, 40-45 cm long, 1-2 cm wide, with asymmetrical tips, glaucous on both surfaces, becoming eglaucous with age; expanded part of spathe 40-48 cm long, 3-5 cm wide, deeply plicate-sulcate, covered with dense brown tomentum, becoming glabrous with age; branched part of spadix 30-40 cm long, rachillae 11-14 in number, 22-25 cm long, peduncular part 50-72 cm long; male flowers 6-7 mm long on lower part, 4-5 mm long, in upper part; female flowers triangular or ovoid, 4-6 mm long, 4 mm in diam, calyx brownish, distinctly striated or nerved, often shorter than the yellowish smooth corolla; mature fruits ovoid or obovate, 1.8-2.5 cm long, 1.3-1.5 cm in diam, beak 4 mm long, endocarp woody, 1.0-1.5 cm thick, locule one, seed not seen.

Specimens examined: Brazil, Bahia, Situ do Ouro, 15 km N.W. of Caetité, about 100 clumps seen in caatinga, associated with Bactris tucum, Glassman & Costa 8728 (CHI, neotype); 8729 to 8739, inclusive (CHI).

Distribution: Brazil, Bahia, endemic to caatingas, approximately within an 80 km radius of Caetité.

Vernacular name: Coco da vassoura.

In his original article, Burret (1933) said that this taxon seemed to be related to Syagrus petraea (Mart.) Becc., an acaulescent palm with unclustered pinnae and unbranched spadices; in my 1971 article I linked S. werdermannii with another acaulescent species, S. campylospatha (Barb. Rodr.) Becc.; and in 1977, I compared it with S. microphylla. Even

though S. werdermannii has a leaf anatomy pattern similar to both S. microphylla and S. vagans, it probably is more closely aligned to the latter taxon because of the more similar morphological characteristics.

Syagrus microphylla Burret, Fedde Rep. Nov. Spec. 32:111. 1933; Glassman, Phytologia 38:66-68, fig. 1. 1977.
Holotype: Brazil, Bahia, Serra do Espinhaço, Östlich Monte Chapeo, open plain, April, 1932, (Werdermann 3366-B, destroyed). Neotype: Bahia, Serra do Tombador, 6 km S. of town of Morro de Chapeu, 1100 m elevation, Feb. 1971 (H. Irwin, R. M. Harley & G. L. Smith 32470 UB). c.f. Glassman 1977, p. 66.

Acaulescent, often with a prostrate or flattened appearance. Petiole 7-12 cm long, margins smooth, sheathing base about 7 cm long; rachis of leaf 29-45 cm long, pinnae 20-21 pairs, middle ones in tight clusters of 2-3, densely glaucous, especially above, 10-22 cm long, 0.8-2.0 (2.5) cm wide, tips obtuse and asymmetrical; expanded part of spathe 13-15 cm long and 2-3 cm wide, peduncular part 23-30 cm long, mostly glabrous, plicate-sulcate outside; branched part of spadix 9-13 cm long, peduncle 17-31 cm long, rachillae 4-6 in number, lower ones 5-10 cm long; male flowers 4-6 mm long, sepals 0.5-1 mm long; female flowers more or less triangular in shape, 5-7 mm long, 3-5 mm in diam, fruits rounded to ovoid, 1.5-2.2 cm long, 1.0-1.3 cm in diam, persistent perianth 0.5-0.7 cm high, endocarp woody, about 1 mm thick, one locule, seed not seen.

Specimens examined: Brazil, Bahia (see neotype above); Serra do Tombador, 2 km S.W. of Morro de Chapeu, on road to Utinga, caatinga vegetation, assoc. with Allagoptera and various cacti, very local for radius of about 5 km on white sandy soil, common here, Aug. 1976, Glassman 13018, 13019, 13020, 13021, 13023, 13025, 13026, 13027, 13028, 13029, 13030, (CHI, SP).

Vernacular names: none recorded.

Distribution: Brazil, state of Bahia, apparently endemic to the Morro de Chapeu mountain area, primarily on white sandy soil in the caatinga.

Burret (1933) was in error when he placed Monte Chapeo (Morro de Chapeu) in the Serra do Espinhaço. No mountain range of this name exists in the area, but there is a Serra do Espinhaço running through Diamantina, in the state of Minas Gerais. Morro de Chapeu properly belongs in the Serra do Tombador mountain range. The above cited specimens match Burret's descrip-

tion of S. microphylla fairly closely, and undoubtedly were collected in the same general area of the type locality; therefore, I have chosen one of these specimens (Irwin et al. 32470) as the neotype.

Syagrus microphylla is a distinct species, nevertheless the leaf anatomy pattern apparently links it to the other five taxa discussed here. Its closest relatives are probably S. harleyi and S. werdermannii, but it can be easily distinguished from them by the prostrate habit, the tightly clustered, very short middle pinnae, relatively short peduncle and a spadix with only 4-6 rachillae.

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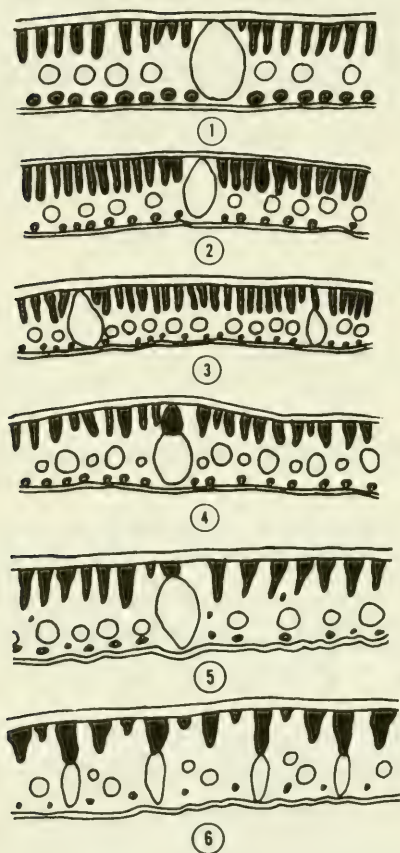
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Figures 1-6. Cross sections of pinnae of six related species of Syagrus. Double lines on upper (adaxial) and lower (abaxial) sides represent upper and lower epidermis. Solid tissues indicate clusters of nonvascular fibers, whereas circles depict veins of various sizes. All other tissues have been omitted from diagrams.

- Figure 1. S. schizophylla. Glassman & Costa 8721 (CHI) x110
2. S. ruschiana. Glassman & Costa 8743 (CHI) x110
 3. S. vagans. Glassman & Costa 8725 (CHI) x66
 4. S. werdermannii. Glassman & Costa 8728 (CHI) x110
 5. S. microphylla. Glassman 13018 (CHI) x110
 6. S. harleyi. Harley et al. 15963 (F) x110



Figures 1-6. Cross sections of Pinnae of six related species of *Syagrus*.



Figure 7. S. harleyi. Holotype. Harley et al. 15963 (K). Mature flowering spathe and spadix.



Figure 8. S. ruschiana. Stand of trees in background and columnar cacti growing on black gneissic rocks. 13 km E. of Colatina, Espirito Santo.



Figure 9. S. ruschiana. Lectotype. Bondar
s.n. (F-620822). Infructescence with
mature fruits, whole and sectioned.

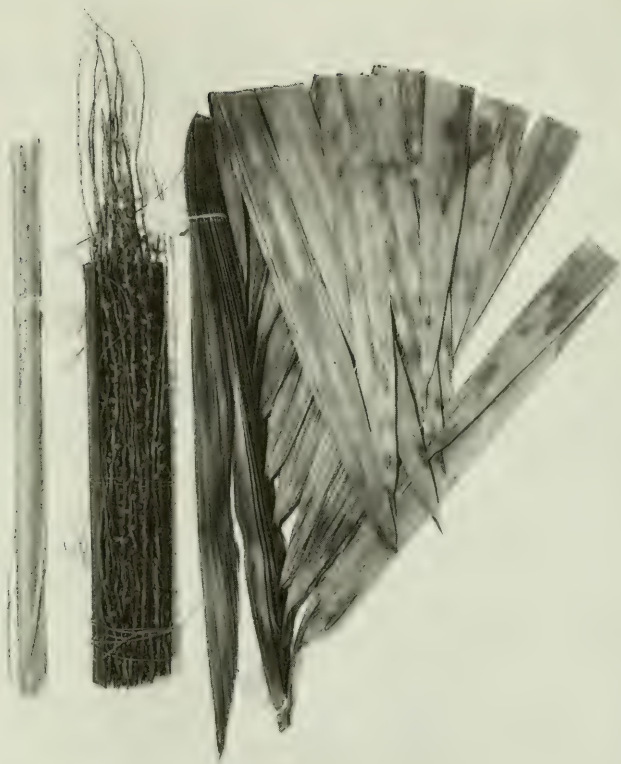


Figure 10. *S. ruschiana*. Lectotype. Bondar
s.n. (F-620822). Parts of inflorescence
and leaf.



Figure 11. S. schizophylla. Stand of young trees along beach near Pituba, Bahia.



Figure 12. S. schizophylla. Mr. Costa holding leaf and inflorescence. Same locality as figure 11.



Figure 13. S. schizophylla. Lectotype.
Martius 1924 (M).

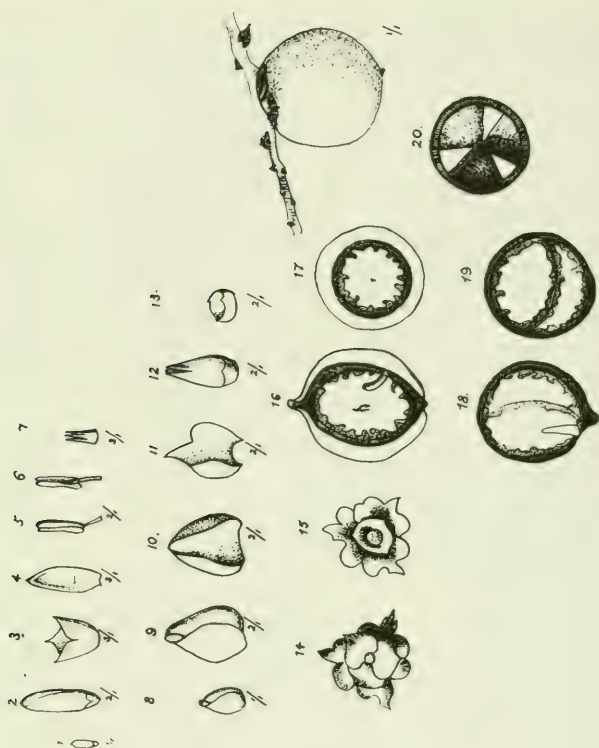


Figure 14. *S. schizophylla*. After Barbosa Rodrigues (1903), t. 90A. First row - male flowers, second row, female flowers. Third and fourth rows - persistent perianth and fruits, some showing ruminant endosperm of seed.



Figure 15. S. vagans. Mr. Costa holding
inflorescence and infructescence.
Lagedo Alto, Bahia.



Figure 16. S. vagans. Lectotype. Bondar
s.n. (F-619777). Infructescence and
inflorescence.



Figure 17. S. vagans. Lectotype., Part of leaf with fruits.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXIII

Harold N. Moldenke

LANTANA INVOLUCRATA f. *LEUCOCARPA* Moldenke, f. nov.

Haec forma a forma typica speciei fructibus albis recedit.

This form differs from the typical form of the species in having its mature fruit white. The leaves on the type collection were "burnished orange" when fresh according to the collector, and this was true of the entire population, the only form of the species on the east side of the island, where it is abundant.

The form is based on William T. Gillis 14467 from a swale behind the beach, growing in sand, about 400 m. north of the southeast corner of East Caicos, Turks and Caicos Islands, collected on April 1, 1978, and deposited in my personal herbarium. The plant is described as a shrub to 1.4 m. tall.

LANTANA URTICOIDES var. *HISPIDULA* Moldenke, var. nov.

Haec varietas a forma typica speciei ramulis petiolisque venis primariisque plusminusve dense albo-hirsutis vel -hirsutulis recedit.

This variety differs from the typical form of the species in having its younger parts, branchlets, twigs, petioles, and the primary venation on the lower leaf-surfaces more or less densely white-hirsute or -hirsutulous to almost white-villose.

The type of the variety was collected by D. S. Correll (no. 15206) in sandy soil about 3 miles south of Devine, Medina County, Texas, on October 28, 1952, and is deposited in the United States National Herbarium at Washington.

It seems that most of the coarse-toothed relatively glabrescent material hitherto passing as *L. horrida* H.B.K. actually is typical *L. urticoides* Hayek, while the very thorny-stemmed and matted-tomentose leaved material, hitherto regarded as *L. scorta* Moldenke, is the true *L. horrida*.

CALLICARPA KOCHIANA f. *VILLOSULA* Moldenke, f. nov.

Haec forma a forma typica speciei pilis breviter villosulis recedit. This form differs from the typical form of the species in having the hairs on its stems, branches, petioles, peduncles, etc. only short-villosulous.

The type of this form was collected by Lin Lee-Kwan (no. 31) in the vicinity of Foochow, Fukien, China, between June 24 and 28, 1948, and is deposited in the herbarium of the University of Michigan at Ann Arbor.

VITEX MEGAPOTAMICA var. *MULTINERVIS* (Cham.) Moldenke, comb. nov.

Vitex montevidensis var. *multinervis* Cham., Linnaea 7: 374. 1832.

STUDIES ON VENEZUELAN HEPATICAE, II.

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Family CEPHALOZIACEAE

30. Cephalozia venezuelana Schust., sp. n.

Species speciei C. bicuspidatae similis (ramificatione libera typi Frullaniae, inflorescentiis autoeciis atque orientatione foliorum obliqua) distincta, autem, ut lobi foliorum ad basim tantummodo 4-5 cellularum latitudine; perianthium lobulato-ciliatum, ciliis partim 3-4 cellulas longitudine. Type. Estado Merida: Sierra Nevada de Merida, 2650 m. (RMS & L. Ruiz-Teran 76-1472a).

Keying to C. subforficata in Fulford's key (1968, pp. 311-12), but at once distinct in the deeply (to 0.5-0.6) bifid leaves, with erect or divergent segments; autoecious inflorescences; elongated cells of the perianth mouth cilia. Perhaps a mere subspecies of C. bicuspidata, but the perianth mouth is much more deeply incised-lobulate, with lobes longly ciliate.

Family CEPHALOZIELLACEAE

The recent treatment of Fulford (1976) unfortunately contains some errors and omissions. It fails to correctly state the sexuality of some taxa; the diagnoses lack adequate precision and fail to mention, i.e., presence or absence of flagella, branching patterns, spatial relationships of gynoecia and androecia -- all criteria of major significance in defining the taxa. Thus it has been impossible to utilize her treatment -- especially since she also fails to even distinguish the subgeneric units used by all workers since the time of Muller (1947); consequently I have been unable to place two of several taxa collected in Venezuela.

31. Cephaloziella (Prionolobus) grisea Schust., sp. n.

Planta tenuis flexuosaque, remote pinnulata ramis laterali-intercalariis (ramis ventrali-intercalariis typi Frullaniae non visis); plantae siccatae albido-virides ad albido-cinereas, ob membranas cellularum sine colore et maxime crassas atque ob cuticulam valde papillosam. Amphigastria hic illic distincta, lamellata. Gynoecia interdum purpurascens; cacumina surculorum gemmipara purpurascens; gemmae maturae purpurascens, 1(2)-cellulares, irregulariter (3)4-5(6)-angulate, angulis rotundatis pachydermatisque. Plantae heteroeciae. Type. Estado Merida: Sierra Nevada de Merida, 4150 m. (RMS & L. Ruiz-Teran 76-1499a).

Gemma form fails to exactly correspond to that in Prionolobus -- or to any other of the gemma-derived segregates given in Douin (1920),

yet they fall nearest to this. The loosely complicate-folded, spinose-dentate margins of larger leaves are also as in that subgenus. Yet Prionolobus supposedly lacks underleaves -- even though vigorous axes of C. grisea may bear them. In the type of Prionolobus, C. turneri, and its near allies, gynoecia are acrogynous. All of the dozen gynoecia of C. grisea seen were on varyingly abbreviated axes -- more than half occupied very short lateral-intercalary branches.

32. Cephaloziella (Cephaloziella) stolonifera Schust., sp. n.

Plantae autoeciae, androeciis gynoeciisque plerumque fere juxtapositis; gynoecia in ramis intercalaribus abbreviatisque semper sita, ex axibus longis, foliaceis (saepe σ) enascentia; amphigastria distincta; ϕ bractae ad basim connatae; ramificatio terminalis carens; stolona microphyllous abundantia; amphigastria nulla aut vestigialia et 1-2-cellularia. Type. Estado de Santo Domingo: Lago Los Patos, 3650 m. (RMS & L. Ruiz-Teran 76-980.)

Although lacking gemmae, this taxon clearly belongs to the C. elachista-spinigera-pulcherrima complex, as is evident from the criteria cited in the Latin diagnosis above. Distinct from all three allied species in the copious development of flagelliform, microphyllous axes. Unlike in C. pulcherrima Schust., of Australasia, to which it is perhaps most nearly allied (the two taxa share basally conspicuously connate bracts + bracteole), gynoecia and androecia are never clustered and may, indeed, be relatively widely spaced.

Family LEJEUNEACEAE

33. Cyrtolejeunea venezuelana Schust., sp. n.

Plantae vivide gramineo-virides; C. antillanae Schust. cognatae, differentes, autem, eo quod: plantae minores, lobis dorsalibus magis convexis, magis elevatis atque satis abbreviatis; longitudo carinae ca. 0.55-0.7 longitudinis folii; pars lobi dorsalis a carina distalis tantummodo 9-10 cellulis lata; amphigastria incisuram apicalem non profundam sed acutam saepe habentia; gynoecia (saltem plerumque) in axibus primariis foliaceis cum duobus innovationibus sita. Type. Estado Tachira: Villa Paez, 2450 m. (RMS & L. Ruiz-Teran 76-2078a).

Although the lobular apex suggests an affinity to C. antillana, the preceding distinctions prohibit any close relationship to that taxon.

Oil-bodies are minute, rather numerous, and homogeneous. The stem has 7 rows of large, rather leptodermous to feebly thick-walled cortical cells surrounding as few as 4 or as many as 9-15 rows of much smaller, almost wholly thin-walled medullary cells.

34. Cheilolejeunea (Strepsilejeunea) nana Schust., sp. n.

Plantae minimae albidaeque; ut videtur dioeciae (σ non visa); perianthium inflatum, a sectione transversa visum pentagonali, breve, lato-ovoideum, longe rostratum; una innovatio subfloralis semper praesens; caulis ordines cellularum 7 corticalium + 4(5) medullosarum habens. (1)2 guttae olei omni in cellula, e paucis segmentis compo-

sitae, crescenticae. Type. Estado Tachira: Below Paramo de Tama, 2560 m., (RMS & L. Ruiz-Teran 76-2061b).

Perianths are short-ovoid, inflated and almost included, 5-keeled only in the distal half and very long beaked, the beak orange. Lobe cells are convex, the convexity thick-walled -- this is especially distinct along the keel which is papulose-tuberculate.

35. Cheilolejeunea (Strepsilejeunea) erostrata Schust., sp. n.

Plantae autoeciae, gynoecia in ramis foliaceis longis (tum 2 innovationes habentes) aut in ramo brevi (tum unam innovationem habentes) sita; androecia semper basalia, in ramis brevibus sita; caulibus 7 cellulas corticales magnas, satis leptodermatas et ca. 17-19 ordines cellularum medullarum, fere leptodermatarum minimarumque habens; perianthium erostratum, superficie dorsali plana ad concavam, carinis lateralibus obtusis et male definitis, superficie ventrali singulari carina inflata humili praedita (perianthium ita obtuse trigono-compressum). Type. Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1921e).

The perianth form is unique within subg. Strepsilejeunea, so far as my experience with this ill-defined subgenus goes. Underleaves are large, adaxially concave, and inserted on a short, inverted U.

36. Cheilolejeunea (Strepsilejeunea) invaginata Schust., sp. n.

Plantae autoeciae; gynoecia in axibus longis (2 innovationes habentia) aut interdum in ramis brevibus (1 vel 2 innovationes habentia) sita; caulibus 7 cellulas corticales rigidas, pachydermatas et 10-12 ordines cellularum medullarum, his ca. 0.7-0.8 diam. cellularum corticalium, membranis solidis habens; perianthium erostratum (ore invaginato-depresso) longum, longe emergens, distaliter 5-carinatum. Type. Estado Tachira: Paramo de Tama, 2490 m. (RMS & L. Ruiz-Teran 76-2056a).

Agreeing with the two preceding species in the whitish gray to whitish color of living plants. All three taxa bear sharp leaf lobes but only C. nana has a "normal" Cheilolejeuneoid perianth; the other two taxa are quite distinct in perianth form.

37. Drepanolejeunea urceolata Schust., sp. n.

Lobi remoti, suberecti, tenuissimi, lanceolati (longitudine: latitudine = 6-9:1), serrulati, apex non falcatus, 1-2 cellulis terminatus; dentes triangulares, multi obliqui, unicellulares aut cellulis marginalibus eminentibus formati; serrulationes marginis dorsalis 8-11. Dens lobularis perelongatus (4-6:1), uncinatus, attenuatus. Cellulae pachydermatae, sine trigonis et incrassationibus mediis, convexae sed non armatae. Ocelli 3-4 in linea interrupta ordinati, ocello basali e basi una cellula remota, ocello proximo e basali una cellula remoto. Plantae autoeciae. Gynoecia in ramis lateralibus brevibus normaliter sita, innovationem sterilem habentia; perianthium urceolatum, basi substipitata, distaliter non contractum, sed 9-10 lobos triangulares expandentes acutos et dentatos ferens.

Type. Estado Merida: Rio Frias, Sierra Nevada de Merida, 2730 m. (RMS & L. Ruiz-Teran 76-1497b).

Unique not only in Drepanolejeunea, but in the Lejeuneaceae in the unique perianths that lack any distal constriction, being campanulate-urceolate, with a flaring lobed and toothed mouth.

38. Aureolejeunea Schust., gen. n.

Plantae laxae repentes, substrato semper solute affixae; aureae ad fulvas, minime in sectoribus maturis; cortex in 16 vel pluribus ordinibus ordinatus; merophyta ventralia 2 vel 4 cellulis lata; folia convexa, in margine integra; lobulus ad basim atque secundum carinam inflatus, margine discreto plano appressoque; papilla hyalina distalis, marginalis, in parte media sinus sita. Amphigastria non lobata, latiora quam longa, in arcu lato aut linea semicirculari inserta. Cellulae solidae, trigona crassa tumescentia aequilateralia habentes; guttae olei 2-4 omni in cellula, magnae, crasse botryoideae. Plantae autoeciae. Androecia basalia, cladogena; bracteola tantummodo ad basim reperta. Gynoecia in axibus foliaceis longis ad plus minusve breves sita; 1-2 innovationes habentia. Perianthium 4, 5 aut (distaliter) 10 carinas subcutas ad obtusas rotundatasve habens. Seta 12 + 4 ordines habens. Type. A. aurifera Schust., sp. n.

The lobule and seta morphology suggest Leucolejeunea, but Aureolejeunea is distinct in the (a) 2-4 (rather than 1) oil-bodies per cell; (b) nonadnate, loose and often shingled mode of growth; (c) presence of cell wall pigments; (d) coarse trigones; (e) very variable perianth form; (f) tendency for the keel of σ bracts to be winged.

In addition to 4 Venezuelan taxa, a fifth occurs in Indomalaya; it must go into a distinct section and the two are separable as follows:

1. Leaf lobules with proximal portions of anterior margin incurved but distal portions (including the externally evident apical tooth and hyaline papilla) flatly appressed to lobe; apical tooth acute to blunt to rounded, never inflexed. Lobule strongly elongated (0.4-0.5 length of lobe). Autoecious. Neotropical.

Sectio Aureolejeunea

1. Leaf lobules with free margin inflexed throughout; no distinct apical tooth, the lobule apex a rounded, inflexed appendiculum. Lobule abbreviated (0.2-0.3 length of lobe). Dioecious. Indo-malayan.

Sectio Omphalanthopsis Schust., sect. n.

39. Aureolejeunea paramoensis Schust, sp. n.

Perianthium in triente distali 10 carinis subcutis (3 dorsali-bus, 5 ventralibus, 2 lateralibus) praeditum; rostrum vix perceptibile; cellulae folii non elevatae; "dens" apicalis lobularis non dentiformis, rotundatus ad obtusum. Type. Estado Tachira: Paramo de Tama, 3140 m. (RMS & L. Ruiz-Teran 76-1920a).

The only species of the genus with a 10-plicate perianth.

40. Aureolejeunea fulva Schust., sp. n.

Perianthium 2 carinas laterales rotundatas perinflatas atque 2 carinas ventrales similes, inferiores, autem, et minus definitas habens; superficies dorsalis perianthii plana ad concavam, ecarinata; rostrum vestigiale, recessum, carinis lateralibus distaliter inflatis. Cellulae folii non tuberculata-elevatae. Type. Estado Merida: La Carbonera, 2300-2350 m. (RMS & L. Ruiz-Teran, 76-305).

The perianth is unique in the genus. Unlike the other three species, this plant shows almost no cell wall pigmentation.

41. Aureolejeunea aurifera Schust., sp. n.

Perianthium 5 carinas bene definitas habens, carina dorsali non aut vix inferioribus quam ventralis, carinis rotundatis ad satis compressas; omnia cellula folii projectione indrassata mammiliformi aut tuberculo armata; apices lobi decurvato-involuti, subcucullati; merophyta ventralia ca. 4 cellulis lata. Type. Estado Merida: Sierra de Santo Domingo, paramo at 3700 m. (RMS & L. Ruiz-Teran 76-945).

The only species of the genus with the cells tuberculate-elevated. Perhaps closest to the next in perianth form, but very different in the strongly concave leaf lobes, with the apices almost hooded.

42. Aureolejeunea quinquecarinata Schust., sp. n.

Perianthium 5 carinas aequales maxime acutas longasque habens; cellulae folii aequae convexae, non armatae; apices lobi non inflexi, lobis solummodo convexis; merophyta ventralia 2 cellulis lata. Type. Estado Tachira: Paramo de Tama (RMS & L. Ruiz-Teran 76-1921d).

Distinct from the preceding three species in the sharply and longly quinquecarinate perianths.

43. Physantholejeunea Schust., gen. n.

Plantae viventes smaragdinae, fere aut omnino sine pigmentatione secundaria; lamella media opaca nulla; apices foliorum caulis cellulis hyalinis atque digitiformibus in apice aggregati armati; margo discretus lobularis per cellulas maxime angustissimas elongatasque praetexus; corpora olei vestigialia ut guttulae olei minutae apparentia; ocelli sparsi, in lobis, lobulis atque amphigastriis praesentes; utriculi nulli; amphigastria non lobata. Carina σ bractearum acuta, interdum distaliter alata. Type. Lejeunea portoricensis Hpe. & G., Linnaea 25:352, 1852 = Physantholejeunea portoricensis (Hpe. & G.) Schust., comb. n.

The plant has been placed into both Neurolejeunea and Ceratolejeunea. Stem anatomy eliminates it from the former; numerous criteria separate it from the latter (i.e., the contrast between adnate primary and ascending to pendulous or spreading secondary axes; lack of wall pigments and of a differentiated middle lamella; lack of distinct oil-bodies in nonocellar cells; lobule morphology; the compound irregular surface papillae of the cells; the peculiar hyaline cells

of lobe apices of the leaves of primary stems).

44. Ceratolejeunea subg. Caduciloba Schust., subg. n.

Subgenus a subg. Ceratolejeunea distinctum eo quod lobulus tenuis ampulliformis, infra apicem expandentem constrictus, 0.55-0.75 long. lobi, margine omnino involuto; ♀ bractae edentatae numquam utriculos habentes. Type. Ceratolejeunea patentissima (Hpe. & G.) Evs.

Including besides the type a second Venezuelan species:

45. Ceratolejeunea (Caduciloba) andicola Schust., sp. n.

Plantae minutae, nitidae, clare brunneae; caulis 4-5(6) ordines medullosos cellularum fere leptodermatarum habens; folia persistentia, vix falcata, oblique patentia; amphigastria parva, remota, per rham clausam 1(2) cellulis profundam paululum incisa, aspectu, autem, non lobata. Type. Estado Tachira: Paramo de Tama, 3050 m. (RMS & L. Ruiz-Teran 76-1955a).

Unlike the type, which has 1-2 basal ocelli (in some populations, at least) and single oil-bodies per cell, this species seems to uniformly have single ocelli or to lack them, and has 1-2(3) oil-bodies per cell. The superficially unlobed underleaves at first suggest a species of Dicranolejeunea is at hand.

46. Cyclolejeunea (Prionocolea) marginata Schust., subg. et sp. n.

Plantae subvirides ad albido-virides, subpellucidae. Caulis ordines cellularum 7 corticalium atque ca. 10 medullosorum habens. Lobi cellulis parvis quadratis non-eminentibus marginatus, ita non denticulati. Amphigastria usque ad 0.65 bifida. Ocelli nulli. Reproductio asexualis nulla. Plantae autoeciae; androecia ex 1-3(4) partibus bractearum solum constantia, cladogenea, sessilia. Plera gynoecia in ramis lateralibus brevibus sita, innovationem brevem, sterilem ferentia, alia gynoecia ad apicem caulis, 1-2 innovationes steriles habentia. Perianthium obcordatum, + compressum, carinis lateralibus alas binas lacerato-laciniatas habentibus; carina ventralis aut carinae binae interdum distinctae et similiter armatae. Type. Estado Tachira: Bosque Valencia below Paramo de Tama, Villa Paez (RMS & L. Ruiz-Teran 76-2279).

Although at first believed to be a Prionolejeunea (because of the apparently consistently sterile and usually short and weak ♀ innovations; lack of ocelli, and because of the lacerate-lacinate paired wings of the lateral perianth keels), the smooth-margined leaf lobes and the occasionally paired innovations of acrogynous gynoecia suggest such a disposition is unnatural. The position within Cyclolejeunea is hardly more satisfactory, and subg. Prionocolea could be placed with almost equal justification into either genus. Unique, and not found in other taxa assigned to Prionolejeunea or Cyclolejeunea, is the marked tendency on larger perianths for one or both ventral angles ("keels") to bear partial or complete, lacerate wings -- much like the lateral keels. Possibly deserving

generic status.

47. Amphilejeunea viridissima Schust., gen. et sp. n.

Planta + nitida, mollis, clare hyalineque viridis (defuncta subflava), crescens imbricata aut pulvinata (in virgis ramulisque in regione "paramo" dicta colens); cellulae corticales magnae, laxae, in 7 seriebus ordinatae; cellulae medullosae in 18-22 seriebus ordinatae. Folia convexa, ad apicem rotundata, in margine integra; lobulus papillam hyalinam paululum entaliter summotam habens. Amphigastria magna, imbricata, non lobata, margine anguste revoluta. Plantae dioeciae. Androecia subsessilia, in ramis brevibus sita; bracteola solum ad basim reperta. Gynoecia in axibus primariis foliaceis, 1(2) innovationes subflorales habentia; bracteola non lobata. Perianthium maturum longe stipitatum (stipite saepe 2-3 plo longiore quam perianthium), 5-carinatum, carinis 2 alis late patentibus, 3-4 vel plures cellulas latitudine, distaliter armatis. Seta 12 + 4 ordines cellularum habens. Type. Estado Merida: Sierra de Santo Domingo, between Lagunita Verde and Laguna los Patos, 3700 m. (RMS & L. Ruiz-Teran 76-905b).

The unlobed leaves, ♀ bracts, and slightly entally displaced hyaline papilla of the lobule suggest the Ptychanthoideae, from which stem and seta anatomy separate it. Within Lejeuneoideae I know of no near allies. Common on shrubs and small trees in and near the paramo margin.

48. Diplasiolejeunea papilionacea Schust., sp. n.

Species D. johnsonii similis ut lobi foliorum maxime convexi, apicibus marginibusque lobi perspicue decurvato-involutis; differens eo quod amphigastria enormia, lobis ovatis 22-28 vel plures cellulas latitudine, adaxialiter convexis, differens necnon ut plantae unisexuales, et dens apicalis lobuli omnino 2 cellulas latitudine, plerumque 6-7 cellulas longitudine. Type. Estado Merida: Trail to Rio Frias, below 2500 m., in cloud forest below Sierra Nevada de Merida (RMS & L. Ruiz-Teran 76-1489).

The underleaf lobes, in width and orientation, simulate the front wings of a butterfly, hence the species name. Underleaf form suggests the African D. runssorensis Steph., but this has underleaf lobes 16-18 cells broad.

49. Aphanolejeunea subsphaeroidea Schust., sp. n.

Folia remota, dimorphica, latissima in parte media, folia lobulata lata (ca. 1.1-1.2:1), perspicue inflata subsphaericaque; lobus convexus, apice valde flexo-involuto; lobulus permagnus, ca. 0.9 maior quam lobus longitudine areaque, perspicue inflatus; apex lobuli 2 dentes iuxtapositos, dentes distali bicellulari, habens. Folia elobulata ovato-elliptica et ca. 6 cellulas latitudine. Plantae dioeciae. Type. Estado Merida: Sierra Nevada de Merida, 2730 m., on trail to Rio Frias (RMS & L. Ruiz-Teran 76-1500).

Unique in Aphanolejeunea in the strongly inflated-appearing

leaves on which the lobe apex is so deflexed-involute that this apex results in the opening to the water-sac being displaced toward the substrate.

FOOTNOTES

1 Esta investigación fue sufragada con fondos suministrados por el Consejo de Desarrollo Científico y Humanístico (C.D.C.H.) de la Universidad de los Andes, Mérida, Venezuela, Proyecto FA-17-76. The National Science Foundation (USA) provided funds for the air transport to Venezuela. I am indebted to Profs. Oswaldo Lopez Figueras and Luis Ruiz-Teran for innumerable favors and, to the latter, for intensive and extensive aid in the field. I am also indebted to Dr. Hannah Croasdale for the Latin diagnoses.

2

Sectio Omphalanthopsis Schust., sect. n. Sectio a sectione Auriferain distincta ut inflorescentiae dioeciae, lobuli breves, margine discreto, et apex latus appendiculiformis omnino inflexus atque sine dissectione invisibilis. Type. Aureolejeunea decurrens (Steph.) Schust., comb. n. [Basionym: Hygrolejeunea decurrens Steph., Hedwigia 35:101, 1896].

This species has been erroneously assigned to Leucolejeunea by Mizutani (Jour. Hattori Bot. Lab. no. 40:443, 1976).

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NOTES ON VENEZUELAN TAXA

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The following new combination in Myrsinaceae and description of a new taxon in Boraginaceae are herewith presented in order to validate these names for Steyermark and Huber's FLORA OF AVILA.

CYBIANTHUS GLABRUS (Mez) Agostini, comb. nov.

Conomorpha glabra Mez, Pflanzenreich 4, Fam. 236: 254. 1902.

CORDIA ARISTEGUIETAE Agostini, sp. nov.

Arbol ad 12 m. alta, ramulis dense pilosis; foliis dimorphis, late obovalibus vel suborbicularibus 4.8-10 cm. longis 3.2-8 cm. latis, basi acutis vel obtusis apice obtusis vel acuminatis, supra strigosis vel pilosis subtus pilis erectis vel suberectis ornatis, petiolis dense pilosis; inflorescentia cymoso-paniculata terminali 2.5 cm. longa 1.5 cm. lata, pedunculo 1.5 cm. longo dense piloso; floribus masculinis: calyce in anthesi cupulato 3.5-4 mm. longo extus dense brunneo-strigoso intus dense cano-piloso, lobis 5 triangularibus 1 mm. longis 1.3 mm. latis apice rotundatis; corolla 6.5 mm. longa basi 1.5 mm. diam. fauce 2.5 mm. diam., tubo 3.5 mm. longo, lobis 5 anguste ellipticis 4.5 mm. longis 1.8 mm. latis apice rotundatis; filamentis 4-5 mm. longis basim versus pilosis; ovario glabro.

VENEZUELA: ESTADO MIRANDA: Alto de Pipe, 10° 23.7' N. Lat., 67° 0.1' W. Long., alt. 1500 m., 10 May 1963, G. Agostini 165 (holotype, VEN).

Paratypes: DISTRITO FEDERAL: lomas arriba de Agua Negra, alt. 1400 m., 18 de Marzo 1938, Llewelyn Williams 9932 (VEN); Avila, Abril, 1964, José R. García s.n.

Distinguished from C. hirta Johnst. by the longer filaments and usually smaller, less pubescent leaves.

ADDITIONAL NOTES ON THE GENUS LIPPIA. XI

Harold N. Moldenke

LIPPIA Houst.

Additional & emended bibliography: J. C. & M. Willis, Rev. Cat. Flow. Pl. Ceyl. [Parad. Man. Bot. 2:] 68 & 159. 1911; A. & I. Nehrling, Easy Gard. Drought-resist. Pl., imp. 1, 304. 1968; Rouleau, Guide Ind. Kew. 111. 1970; A. & I. Nehrling, Easy Gard. Drought-resist. Pl., imp. 2, 304. 1975; Hocking, Excerpt. Bot. A. 28: 170, 257, & 259. 1976; Lelong, Sida 7: 140. 1977; Moldenke, Biol. Abstr. 64: 6575. 1977; Powell, Econ. Bot. 31: 418, 419, & 421. 1977; Moldenke, Phytologia 38: 230--266, 385--406, 474--482, 504--508, 510, & 512 (1978) and 39: 24--46, 78--106, 162--182, 252--267, & 391--395. 1978; A. L. Moldenke, Phytologia 39: 64. 1978.

The Turner & Crutchfield 6262, distributed as a Lippia sp., is Lantana macropoda f. albiflora Moldenke, while Graham & Frohlich 1128 is Lantana velutina Mart. & Gal.

An additional excluded taxon is Lippia scaberrima Altschul, Drugs & Foods 244. 1973 = Phyla scaberrima (A. L. Juss.) Moldenke.

LIPPIA ABYSSINICA (Otto & Dietr.) Cuf.

Additional bibliography: Moldenke, Phytologia 38: 263--266 & 385 (1978) and 39: 31, 32, 80, 81, 105, 181, & 395. 1978.

LIPPIA ALBA (Mill.) N. E. Br.

Additional bibliography: Moldenke, Phytologia 38: 386--406 & 474 (1978) and 39: 29, 86, 99, 104, 105, 167, 260, & 264. 1978.

Material of this species has been misidentified and distributed in some herbaria as Aloysia chiapensis Moldenke. On the other hand, the Tharp, Follansbee, & Thompson 51-1671, distributed as L. alba, actually is Lantana macropoda Torr.

Additional citations: MEXICO: Chiapas: Ton 2186 (Id.).

LIPPIA ALBA var. GLOBIFLORA (L'Hér.) Moldenke

Additional bibliography: Moldenke, Phytologia 38: 474 (1978) and 39: 99, 104, 105, & 260. 1978.

The Humboldt & Bonpland photograph, cited below, is a transfer from the Britton Herbarium.

Emended citations: VENEZUELA: Apure: Humboldt & Bonpland s.n. [Macbride photos 39485] (Z—photo).

LIPPIA AMERICANA L.

Additional bibliography: Moldenke, Phytologia 38: 474--477 & 482 (1978) and 39: 93 & 95. 1978.

LIPPIA AMERICANA f. PILOSA Moldenke

Additional bibliography: Moldenke, *Phytologia* 38: 476—477. 1978.

Nee describes this plant as a shrub, 2 m. tall, and found it growing in open weedy roadsides and open to brushy savanna pastures, at 100 m. altitude, flowering in November. The corollas on Nee 8221 are said to have been "greenish-white" when fresh.

Material of this taxon has been misidentified and distributed in some herbaria as "Labiatae".

Additional citations: PANAMA: Veraguas: M. Nee 8221 (N).

LIPPIA ARECHAVALETAE Moldenke

Additional bibliography: Moldenke, *Phytologia* 38: 478—479 (1978) and 39: 28. 1978.

LIPPIA ASPERRIMA Cham.

Additional bibliography: Moldenke, *Phytologia* 38: 479—480 (1978) and 39: 180. 1978.

LIPPIA BAHIENSIS Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 170. 1976; Moldenke, *Phytologia* 38: 480. 1978.

LIPPIA BRACTEOSA (Mart. & Gal.) Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 24, 27, & 87. 1978.

Additional citations: MEXICO: Chiapas: Breedlove 23049 (Mi).

LIPPIA CALLICARPAEFOLIA H.B.K.

Additional bibliography: Moldenke, *Phytologia* 39: 25—27, 95, 252, & 256. 1978.

LIPPIA CARDIOSTEGIA Benth.

Additional bibliography: Moldenke, *Phytologia* 39: 28—30, 32, 36, 168, 252, 253, 258, & 266. 1978.

Recent collectors have encountered this species along roadsides in "dry mountain forest zone, most natural vegetation cleared for milpas", flowering in July.

Additional citations: GUATEMALA: Guatemala: Harmon & Dwyer 3076 (N).

LIPPIA CHIAPASENSIS Loes.

Additional bibliography: Moldenke, *Phytologia* 39: 30, 32—34, & 36. 1978.

Recent collectors have found this species growing on slopes with montane rainforest of Liquidambar, Magnolia, and Vochysia, flowering in February and November. The corollas are said to have been "yellow" on Breedlove 33433.

Additional citations: MEXICO: Chiapas: Breedlove 33433 (Mi); Breedlove & Dressler 29502 (Mi); Breedlove & Thorne 21323 (Mi).

LIPPIA CONTROVERSA Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 30, 32—34, 166, & 168. 1978.

Recent collectors have encountered this plant on "steep slopes with tropical deciduous forest along ravines". The corollas are said to have been "pale-yellow" on Breedlove 28294.

Additional citations: MEXICO: Chiapas: Breedlove 20375 (Mi), 28294 (Mi).

LIPPIA CORYMBOSA Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 34—35 & 44. 1978.

Irwin and his associates encountered this plant on brown sandy soil in cerrado and describe it as growing "from a thick root"; the corolla-tube on their no. 27508 is said to have been "white".

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27508 (Id).

LIPPIA COSTARICENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 30, 35—36, 252, & 253. 1978.

Recent collectors refer to this species as a tree, 7 m. tall, and have encountered it in fencerows, at 1300 m. altitude, flowering in July.

Additional citations: PANAMA: Chiriquí: Mori & Bolten 7398 (N).

LIPPIA ELEGANS Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 38—39, 263, & 264. 1978.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27193 (Ac).

LIPPIA ELLIPTICA Schau.

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 170. 1976; Moldenke, *Phytologia* 39: 24 & 39. 1978.

LIPPIA ELLIPTICA var. **SILVICOLA** Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 170. 1976; Moldenke, *Phytologia* 39: 39. 1978.

LIPPIA GRAVEOLENS H.B.K.

Additional & emended bibliography: Coult., *Contrib. U. S. Nat. Herb.* 2: 328. 1892; Moldenke, *Phytologia* 39: 82—88, 91, 92, 256, 262, 264, & 267. 1978.

Recent collectors have found this species in shrubby second-growth on slopes and on slopes with Pinus, Quercus, and Acacia.

Additional citations: MEXICO: Chiapas: Breedlove 27656 (Mi), 28468 (Mi).

LIPPIA HARLEYI Moldenke

Additional bibliography: Hocking, *Excerpt. Bot. A.* 28: 170.

1976; Moldenke, Phytologia 39: 89. 1978.

LIPPIA HEDERAEFOLIA Mart. & Schau.

Additional bibliography: Moldenke, Phytologia 39: 90. 1978.

Irwin & al. 28442 originally consisted of a mixture of Lippia hederæfolia and the type collection of L. rosella Moldenke, the latter portion now cited as no. 28442a.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27267 (Ld), 28442 (Ac).

LIPPIA HIRSUTA var. **MORITZII** (Turcz.) López-Palacios

Additional bibliography: Moldenke, Phytologia 39: 92—95. 1978.

The Steyermark 104919, distributed as L. hirsuta var. moritzii, actually is L. schlimii Turcz.

LIPPIA JAVANICA (Burm. f.) Spreng.

Additional bibliography: Moldenke, Phytologia 39: 99—106, 393, & 395. 1978.

Additional citations: SOUTH AFRICA: Cape Province: Collector undetermined s.n. [Mo. Bot. Gard. photos A.865] (W--photo).

LIPPIA LINDMANII Briq.

Synonymy: Lippia lindmannii Briq. ex Moldenke, Phytologia 39: 166, sphalm. 1978.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 39: 166. 1978.

LIPPIA LINDMANII f. **OPPOSITIFOLIA** Moldenke

Synonymy: Lippia lindmannii f. oppositifolia Moldenke, Phytologia 39: 166, sphalm. 1978.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 39: 166. 1978.

LIPPIA LUPULINA Cham.

Additional bibliography: Moldenke, Phytologia 39: 168—172 & 266. 1978.

Additional citations: BRAZIL: Distrito Federal: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 26361 (Ld).

LIPPIA MICROCEPHALA Cham.

Additional bibliography: Moldenke, Phytologia 39: 174—175. 1978.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28309 (Ac).

LIPPIA MICROMERA Schau.

Additional bibliography: Hocking, Excerpt. Bot. A.28: 170. 1976; Moldenke, Phytologia 39: 175—178. 1978.

LIPPIA MYRIOCEPHALA Schlecht. & Cham.

Additional bibliography: Moldenke, *Phytologia* 39: 252--258. 1978.

Recent collectors have encountered this plant on "slopes with small streams, tropical rainforest along the ridges".

Additional citations: MEXICO: Chiapas: Breedlove 26515 (Mi).

LIPPIA MYRIOCEPHALA var. **HYPOLEIA** (Briq.) Moldenke

Additional bibliography: Moldenke, *Phytologia* 39: 252--258. 1978.

Recent collectors have found this plant growing on "steep slopes with montane rainforest".

Additional citations: MEXICO: Chiapas: Breedlove & Thorne 20947 (Mi).

LIPPIA POHLIANA Schau.

Additional bibliography: Moldenke, *Phytologia* 39: 395. 1978.

Recent collectors have encountered this plant in "grassy campo with scattered trees, on crystal sand, wet in some places" and in "quartzite rock outcrops and sandy soil with cerrado", at altitudes of 1000--1370 m., flowering in January, April, and May, fruiting in January. Irwin and his associates refer to it as "occasional".

The corollas are said to have been "white" on Anderson 8063, "dark-rose" on Hatschbach & al. 29099, "red-violet, the throat white" on Irwin & al. 22254, and "tube yellow, lobes white" on Anderson 9995.

The *Lippia nepetacea* Schau., previously regarded by me as conspecific with *L. pohliana*, is now regarded by me as distinct, after careful examination of type material of both taxa. In *L. pohliana* the bracts are wide-spreading and long-acuminate, while in *L. nepetacea* they are closely appressed and merely acute.

Additional citations: BRAZIL: Goiás: W. R. Anderson 8063 (Ac, N), 9995 (Ld, N); J. E. Pohl s.n. [in Brasilia] (Mu--115--cotype, Mu--116--cotype, Z--cotype). Minas Gerais: Hatschbach, Smith, & Ayensu 29099 (Ld, W--2744564); Irwin, Reis dos Santos, Souza, & Fonseca 22254 (N, Z), 22466 (Ac, N).

LIPPIA POHLIANA var. **LONGIBRACTEOLATA** Moldenke, *Phytologia* 31: 385. 1975.

Bibliography: Moldenke, *Phytologia* 31: 385. 1975; Hocking, *Excerpt. Bot. A*: 28: 170. 1976; Moldenke, *Phytologia* 39: 78. 1978.

Anderson and his associates describe this plant as a shrub, 0.4 m. tall, the corollas pink with a yellow eye, and found it growing in cerrado in an area of rocky sandstone cerrado and open rocky hillsides with white sandy soil sloping down to grassy brejo (sedge meadow), creek, and gallery forest, at 1220 m. altitude, flowering in February.

Material of this variety has been misidentified and distributed in some herbaria as *L. gracilis* Schau.

Citations: BRAZIL: Minas Gerais: Anderson, Stieber, & Kirkbride 35371 (Ld--isotype, N--type, W--2709310--isotype).

LIPPIA POLYTRICHA Briq.

Additional bibliography: Burkart, Excerpt. Bot. A.5: 536. 1962; Moldenke, Phytologia 12: 355—356. 1965; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 893. 1971; Troncoso, Darwiniana 18: 340 & 410. 1974.

LIPPIA POSSENSIS Moldenke, Phytologia 32: 457. 1975.

Bibliography: Moldenke, Phytologia 32: 457 (1975) and 34: 258. 1976; Anon., Biol. Abstr. 61: AC1.640. 1976; Hocking, Excerpt. Bot. A.28: 259. 1976.

Citations: BRAZIL: Goiás: Gottsberger & Gottsberger 138-25771 (Z--type).

LIPPIA PRAECOX Mildbr.

Additional bibliography: Moldenke, Phytologia 12: 356—357. 1965; Moldenke, Fifth Summ. 1: 250 (1971) and 2: 893. 1971.

LIPPIA PRETORIENSIS H. H. W. Pearson

Additional & emended bibliography: H. H. W. Pearson in Thiselt.-Dyer, Fl. Cap. 5: 193 & 197. 1901; Watt & Breyer-Brandwijk, Med. & Poison. Fl. S. Afr., ed. 2, 1052 & 1410. 1962; Moldenke, Phytologia 13: 365. 1966; C. A. Sm., Common Names S. Afr. Fl. 320, 321, 323, & 601. 1966; Moldenke, Fifth Summ. 1: 257 (1971) and 2: 542, 553, & 893. 1971; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 674. 1973.

Smith (1966) reports the vernacular names, "laventelbos", "laventelbossie", "lekkerruickbossie", and "leventelbossie", and asserts that sheep eating this plant become jaundiced and photosensitive. Watt & Breyer-Brandwijk (1962) report "photosensitization accompanied by icterus....It is less toxic than Lippia rehmanni", citing their nos. 1049, 1050, 1052, & 1067.

Pearson (1901) separates this species from the other South African species known to him as follows:

1. Calyx distinctly 2-lobed.
 2. Bracts more than 2 lines long and 1 1/2 lines broad, exceeding the flowers.....L. scaberrima.
 - 2a. Bracts less than 2 lines long and 1/2 line wide, not exceeding the flowers.....L. javanica.
- 1a. Calyx truncate, subtruncate, or obscurely lobed.
 3. Leaves serrate or crenate-serrate.
 4. Bracts more than 2 lines long; calyx truncate or obscurely 4-toothed.....L. wilmsii.
 - 4a. Bracts less than 2 lines long; calyx obscurely 2-lobed.
 5. Adult leaves elliptic, not more than 1 inch long.....L. rehmanni.
 - 5a. Adult leaves ovate, more than 1 1/2 inches long.....L. bazeiana.
 - 3a. Leaves crenate.....L. pretoriensis.

The Meebold 12829, distributed as L. pretoriensis, actually is L. wilmsii H. H. W. Pearson.

Additional citations: SOUTH AFRICA: Transvaal: Burke 402 (Pd).

LIPPIA PRIMULINA S. Moore

Additional bibliography: Moldenke, *Phytologia* 13: 365. 1966; Angely, *Fl. Anal. & Fitogeogr. S. Paulo*, ed. 1, 4: 835 & xi. 1971; Moldenke, *Fifth Summ.* 1: 156 (1971) and 2: 893. 1971; Troncoso, *Darwiniana* 18: 339 & 410. 1974; Moldenke, *Phytologia* 34: 258 (1976) and 39: 44 & 80. 1978.

Irwin and his associates describe this plant as a simple shrub or subshrub, 0.75—1 m. tall, the bracts red- or rose-violet, and found it growing on wet campo slopes, at 950 m. altitude, flowering in June and October. They refer to it as "infrequent". The corollas are said to have been "magenta" on Irwin & al. 17812 and "rose-violet" on Irwin & Soderstrom 7115.

The Angely (1971) work cited above bears an incorrect "1970" titlepage date.

Material of L. primulina has been misidentified and distributed in some herbaria as L. gardneriana Schau.

Additional citations: BRAZIL: Goiás: Irwin & Soderstrom 7115 (Ac, N); Irwin, Souza, Grear, & Reis dos Santos 17812 (N, Z).

LIPPIA PRIMULINA var. GOYAZENSIS S. Moore

Additional bibliography: Moldenke, *Phytologia* 12: 360. 1965; Moldenke, *Fifth Summ.* 1: 156 (1971) and 2: 893. 1971; Moldenke, *Phytologia* 39: 80. 1978.

Recent collectors describe this plant as an herb to 30 cm. tall, from a woody root, and have found it in burned-over cerrado, flowering just after the burning from August to October, at altitudes of 700—1200 meters.

The corollas are said to have been "rose" on Fonsêca 294, "rose-lavender" on Maguire & al. 56346, "rose-violet, the throat white" on Irwin & al. 8577, "rose-lavender, throat yellow with a white border" on Irwin & al. 8739, and "purple with yellow eye in center surrounded by a white area, some purple without eye" on Prance & al. 18949.

Material of this variety has been misidentified and distributed in some herbaria as "L. grandiflora Mart.", L. grandiflora Mart. & Schau., and Lantana sp.

Additional citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 8577 (Ac, N), 8739 (Ld, N). Goiás: S. da Fonsêca 294 (Z); Lützelburg 1465a (Mu). Mato Grosso: Maguire, Murça Pires, Maguire, & Silva 56346 (N); Prance, Lleras, & Coêlho 18949 (Ld, N).

LIPPIA PRINGLEI Briq.

Additional synonymy: Lippia longifolia Pavon ex Moldenke, *Fifth Summ.* 1: 559, in syn. 1971 [not L. longifolia Sessé & Moc.,

1940].

Additional bibliography: Cummins, Lloydia 3: 16 & 62. 1940; Hocking, Excerpt. Bot. A.7: 454. 1964; Moldenke, Phytologia 14: 414. 1967; Uphof, Dict. Econ. Pl., ed. 2, 315. 1968; Gibson, Fieldiana Bot. 24 (9): 213 & 216. 1970; Moldenke, Fifth Summ. 1: 72 & 366 (1971) and 2: 550—552, 557, 559, & 893. 1971; Farnsworth, Pharmacog. Titles 7 (10): ix. 1972; Fong, Trojánek, Trojánek, & Farnsworth, Lloydia 35: 147. 1972; Moldenke, Phytologia 23: 414. 1972; Altschul, Drugs & Foods 244. 1973; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [72]. 1975; Hinton & Rzedowski, Anal. Esc. Nac. Cienc. Biol. 21: 75. 1975; Moldenke, Phytologia 39: 25, 27, 253, & 256. 1978.

Recent collectors describe this plant as a large shrub or small tree, 3—10 m. tall, the trunk 8—15 cm. in diameter at breast height, the "branches whorled" and weak, the foliage "heavy", the leaves odorless, the bracts greenish-white or pale greenish-yellow, the "inflorescence pale-green" or "heads pale", and the flowers aromatic, visited by Hymenoptera, and have found it growing in wet or medium-wet soil in oak woods, in open sun, on the sides of arroyos, in ravines and narrow valleys, in secondary matorral, in woods of Ipomoea and legumes, and near water in shady canyon bottoms, at altitudes of 20—2400 meters, flowering from November to February and in April and September, fruiting in February and November. Delgadillo says "fruto café". The leaf-blades on the Zuccarini Herbarium material cited below are 26—33 cm. long and 9—10.5 cm. wide, the petioles 2.5—4.5 cm. long!

Kruse reports the species "frequent on slopes with woods of Quercus elliptica and Lysiloma acapulcensis in association with Acacia pennatula, 'crece en suelos de arcilla pedregosa con pH6'." Rzedowski & McVaugh found it on "calizas kársticas con vegetación de matorral secundario" and "fondo de la barranca". The Dunns encountered it "in thorn forests on slopes of basaltic block knolls" and the Andersons found it to be "common shrubs or trees in regenerating pine forests with other trees mixed and adventive". McVaugh speaks of it as "abundant on shaded outcrops of dogtooth limestone in oak forests with some Pinus lumholtzii on steep rocky slopes", "abundant in tall humid forests with Fraxinus, Quercus, Abies, Alnus, and Clusia", and "in steep valley in decaying granitic soils with oak-pine forest on ridges and Ficus, Couepia, and other broad-leaves trees in the valley". Breedlove found it "on slopes with Quercus and Erythrina along small streams", on "steep moist north-facing slopes with Carpinus, Cornus, Clethra, Pinus, and Quercus", and "on steep east-facing slopes with Pinus lumholtzii, P. herrerae, Quercus epileuca, Q. viminea, and Arbutus xalapensis". McVaugh reports it "locally abundant", Dieterle "fairly common", and Alava & Cook "common in shrubbery".

The corollas are said to have been "white" on Breedlove 18678 and Ortega 6548, "yellow" on Anderson & Anderson 5605 & 5606, Breedlove & Kawahara 16943 & 17073, Dieterle 4211, Ernst 2446,

Kruse 55, MacDougall H.284, Palacios s.n., and Rzedowski 21881, "yellowish" on Rzedowski 25255, "creamish-yellow" on Alava & Cook 1616, "yellowish-white" on Ortega 5707, "greenish-yellow" on McVaugh 25993, "greenish" on McVaugh 26108, "greenish-white to yellow" on McVaugh 25494, "pale-orange" on Hinton 13482, and "rose" on Delgadillo 209.

Vernacular names reported for Lippia pringlei include "bacarton", "choila", "chokili", and "matayaki". Altschul (1973) reports the occurrence of a medicinal sap in this plant useful in treating toothache (by chewing of the bark?) and that the leaves are also put into hot water, then coated with mentholatum, and applied to bruises and sores, in the treatment of headaches, etc.

It should be noted here that the L. longifolia of Pavon appears to be based on Pavon 36, labeled, doubtless in error, as from "Peru", deposited in the Paris herbarium. The L. longifolia of Sessé & Mocino is a synonym of Phyla stoechadifolia (L.) Small. Uphof (1968) reduces L. pringlei to the synonymy of L. umbellata Cav. Gibson (1970) thinks that L. jurgensenii Briq., regarded by me as a synonym of L. pringlei, may, instead, actually be the oldest name for the plant now known as L. salamensis Loes.

Cummins (1940) reports the parasitic fungi, Prosopodium conjunctum (D. & H.) Cummins and P. lippiae (Speg.) Arth., from Lippia pringlei in Mexico, based on Holway s.n. [Oaxaca, Oct. 23, 1899, type] and Holway 5399 for the former and Holway s.n. [Iguala, Guerrero, Oct. 4, 1900] and s.n. [Oaxaca, Oct. 23, 1899, type of Uredo lippiae D. & H.].

Loesner (1912) cites Seler 1460 & 1743 from Oaxaca, Mexico.

Material of L. pringlei has been misidentified and distributed in some herbaria as L. callicarpaefolia H.B.K., L. hypoleia Briq., L. umbellata Cav., "L. umbellata Cav. sensu lato", and Buddleia sp. On the other hand, the Wiggins 13187, distributed as L. pringlei, actually is L. gentryi Standl.

Additional citations: MEXICO: Guerrero: Hinton 11278 (Ld); Kruse 55 (Ip); J. Rzedowski 25255 (Ip, Mi); Rzedowski & McVaugh 307 (Ip, Ld). Jalisco: Breedlove 17678 (Ld); R. McVaugh 25494 (Mi), 25993 (Mi), 26108 (Mi); Pringle 1733 (Ms—30881—isotype, Mu—1812—isotype, Mu—1813—isotype), 2743 (Ln—70014); J. Rzedowski 21881 (Ip, Mi, Ws); Villarreal de Puga 68 (Ip), 166 (Ip). Michoacán: Hinton 12949 (Se—97685, Tu—112082), 13482 (Se—110740, Tu—92068, Tu—112024), 13614 (Se—97683, Tu—112039). Morelos: Bourgeau 1217 (Mi); Dunn & Dunn 18631 (N); R. Palacios s.n. [14/IX/1964] (Ip), s.n. [2/XI/1964] (Ip), s.n. [14.XI.1964] (Ip), s.n. (Mi); Pringle 13982 (Bl—149656, Tu—134745). Nayarit: Alava & Cook 1616 (Ca—1322452); Gentry, Barclay, & Arguelles 19637 (Ld); R. Palacios s.n. [17/XI/1968] (Mi); Templeton

7003a (N). Oaxaca: Anderson & Anderson 5605 (Sd--78919), 5606 (Mi); L. Conzatti 4826 (Ld); Delgadillo 209 (W--2790790), 220 (W--2790793); Dieterle 4211 (Mi); Ernst 2446 (Mi, W--2798515), 2476 (Mi, W--2798516), 2558 (W--2798514); T. MacDougall H.284 (N); R. McVaugh 22282 (Ip); Makrinus 568 (W--1842816); J. Rzedowski 19280 (Au--243566, Ip); Seler & Seler 1460 [Macbride photos 17497] (W--1205956, W-photo), 1743 (W--1205962). Sinaloa: Breedlove & Kawahara 16943 (Ac), 17073 (Ld); Cummins 70-220H (Tu--178283); J. G. Ortega 5707 (Mu), 6548 (Mu); C. L. Smith 193 (Tu--183232). Sonora: Gentry 4814 (Tu--98608). State undetermined: Gregg 930 (E--116644, E--116646), 937 (E--116645); Karwinski s.n. [Hab. in Mexico] (Mu--139); Pavon 36 ["Peru", 1868] (P); K. Reiche 1029 [Esperanza] (Mu). CULTIVATED: Germany: Herb. Zuccarini s.n. [h. Monac. 1835] (Mu--142), s.n. [Hortus Monac. anno 1845] (Mu--141), s.n. [Hortus bot. Monacensis] (Mu--143); Kummer s.n. [Hort. Monac. 1849.3.I] (Mu--140. MOUNTED DESCRIPTIONS: Loes in Fedde, Repert. Spec. Nov. 9: 366. 1911 (W).

LIPPIA PRINGLEI f. INTECTA Moldenke

Additional bibliography: Moldenke, *Phytologia* 12: 365. 1965; Moldenke, *Fifth Summ.* 1: 72 (1971) and 2: 893. 1971; Moldenke, *Phytologia* 23: 444. 1972.

McVaugh refers to this plant as a tree, 5 m. tall, with flowers that are "orange-yellow on opening, fading to pale-cream", and found it to be "locally abundant in sunny spots in steep rocky valley in tall subdeciduous forest of Hura, Brosimum, Bursera, Psidium, and Hymenaea", at 150 m. altitude, flowering in December.

Additional citations: MEXICO: Jalisco: R. McVaugh 25543 (Mi).

LIPPIA PSEUDO-THEA (A. St.-Hil.) Schau.

Additional synonymy: Lantana pseudothea L. ex Friese, *Bol. Agricult. São Paulo* 34: 317. 1933.

Additional & amended bibliography: J. Grah., *Pl. Bomb.* 156. 1839; Spach, *Hist. Nat. Veg. Phan.* 9: 243. 1840; Lindl., *Veg. Kingd.* 663. 1846; Schau. in *A. DC.*, *Prodr.* 11: 582 & 608. 1847; Twining, *Ill. Nat. Ord. Pl.* 2: 104. 1855; Buek, *Gen. Spec. Syn. Candoll.* 3: 253 & 266. 1858; Schnitzl., *Iconogr. Fam. Nat.* 2: 137 *Verbenaceae* [2]. 1856; Archer, *Profit. Pls.* 126. 1865; T. Peckolt, *Bericht. Deutsch. Pharm. Gesell.* 14: 470. 1904; Friese, *Bol. Agricult. São Paulo* 34: 317. 1933; Darlington & Janaki Ammal, *Chrom. Atl.* 271. 1945; Grieve, *Modern Herb.* 486. 1967; Moldenke, *Phytologia* 14: 444. 1967; Uphof, *Dict. Econ. Pl.*, ed. 2, 315. 1968; Moldenke, *Fifth Summ.* 1: 157 (1971) and 2: 542, 563, & 893. 1971; Hedrick, *Sturtevant's Edible Pl.* 338. 1972; Moldenke, *Phytologia* 31: 402 (1975) and 39: 42. 1978.

Recent collectors describe this plant as a small shrub, 1--2 m. tall, and have encountered it on campos and rocky campos, as well as in sandy soil near rivers, at 1200--1300 m. altitude, flowering in June and September. Hatschbach says that he found

it in "solo arenoso junto com afloramentos de arenito". The corollas are said to have been "yellow" on Williams & Assis 7160, "rose" on Hatschbach 27252 & 27491, and "purple" on Hatschbach 30140. Hatschbach reports the plant as being "Untuoso ao tacta".

The Schnitzlein (1856) reference, cited above, is often cited as having been published in "1843-1870", the titlepage dates, but the pages relating to the Verbenaceae were actually issued in 1856.

Spach (1840) says "Cette espèce croît au Brésil, dans la province des Minas. Ses feuilles ont une odeur très-aromatique; séchées et prises en infusion, elle donnent une boisson très-agréable et fort estimée dans le pays". Uphof (1968) reports its leaves used as a tea in some parts of Brazil; Grieve (1967) also reports its use as a "substitute for tea and its fruit is eaten". Twining (1855) adds that it is employed in Chile in aromatic baths.

Friese (1933) says "Lantana pseudothea L.parcialmente conhecidas sob o nome de camará ou camará (veja-se este verbete) encontram emprego medicamentoso das suas folhas que, provavelmente por causa das pequenas quantidades de óleo essencial que encerram, em infuso mostram efeitos sudoríficos e antipiréticos".

Peckolt (1904) tells us concerning Lippia pseudo-thea: "Auf den Steppengebieten des Staates Minas mit mehreren Volksnamen: Chá de frade - Mönchstee, Capitaß do mato - Negerfängertee und als häufigste Benennung Chá de pedestre - Tee des Fussreisenden! He describes the plant as a "Strauchartige Pflanze mit lanzettlichen, spitzen, an der Basis abgerundeten, ganzrandigen, oberseits papillös-borstigen, unterseits rauhaarigen Blättern. Blüten klein und weiss. Die Blätter sind ungemein wohlriechend, dem Steppenbewohner ein tägliches, wohlschmeckendes Getränk; es ersetzt ihm Kaffee, Tee usw. Auch als Heilmittel sehr geschätzt bei allen katarrhalischen Affektionen sowie als Stimulans und Diuretikum. Die Pflanze verdiente kultiviert zu werden, sie würde für die Parfümerie ein wertvolles ätherisches Öl liefern".

Material of this species has been misidentified and distributed in some herbaria as L. florida Cham.

Additional citations: BRAZIL: Minas Gerais: Glazion 19709 (Mu—4328); Hatschbach 27250 (W—2706627), 27252 (Ld), 27491 (Ld), 30140 (N, W—2706992, Z); Williams & Assis 7160 (G, N).

LIPPIA PUMILA Cham.

Additional synonymy: Lippia pumila Cham. & Schl. ex Moldenke, Phytologia 36: 44, in syn. 1977.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Angely, Fl. Anal. Paran., ed. 1, 576. 1965; Hocking, Excerpt. Bot. A.10: 271 (1966) and A.11: 103. 1967; Moldenke, Phytologia 14: 444. 1967; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 892. 1971; Moldenke, Phytologia 36: 44 (1977) and 39: 259. 1978.

The Irwin, Souza, & Reis dos Santos 9085, distributed as L. pumila, actually is L. nana Schau., while Martius s.n. [Serra de

S. Ant.] is Lantana glaziovii Moldenke.

LIPPIA RADULA J. G. Baker

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 278 & 279. 1900; Moldenke, Phytologia 12: 430—431. 1965; Moldenke, Fifth Summ. 1: 241 (1971) and 2: 542, 564, & 893. 1971; Moldenke, Phytologia 39: 181 & 394. 1978.

The Kassas, Khalifa, & Mobarak 128, distributed as L. radula, actually is L. multiflora Moldenke.

LIPPIA RAMBOI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 366. 1966; Moldenke, Biol. Abstr. 50: 12950. 1969; Hocking, Excerpt. Bot. A.15: 422. 1970; Reitz, Sellowia 22: 81. 1970; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 893. 1971.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 52156 (B), 54583 (B).

LIPPIA RAMBOI var. **PILOSA** Moldenke, Phytologia 18: 294. 1969.

Bibliography: Moldenke, Phytologia 18: 294. 1969; Hocking, Excerpt. Bot. A.15: 422. 1970; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 893. 1971.

Citations: BRAZIL: Rio Grande do Sul: Palacios & Cuezco 1516 (N—type).

LIPPIA RECOLLETAE Morong

Additional synonymy: Lippia recolletae Mold. ex Moldenke, Phytologia 26: 374, in syn. 1973.

Additional & emended bibliography: Briq. in Chod. & Hassler, Bull. Herb. Boiss., ser. 2, 4: 1156—1157. 1904; Briq. in Chod. & Hassler, Pl. Hassler. 2: 492—493. 1904; Michalowski, Serv. Tecn. Interam. Coop. Agr. Bol. 169. 1954; Teague, Anal. Mus. Hist. Nat. Montev., ser. 2, 7 (4): 45. 1965; Moldenke, Biol. Abstr. 47: 6792. 1966; Hocking, Excerpt. Bot. A.11: 450. 1967; Moldenke, Phytologia 14: 414. 1967; Moldenke, Fifth Summ. 1: 183, 186, & 199 (1971) and 2: 564 & 893. 1971; Moldenke, Phytologia 26: 374. 1973.

Recent collectors describe this plant as a semiprostrate herb, shrub, or subshrub, 0.3—1 m. tall, erect, and aromatic, and found it growing in sandy loam, on campos, among grass on dry hills, and at the edge of gallery forests, at altitudes of 216—3350 m., flowering in January, February, May, and October, and in fruit in January and October. They record the vernacular names, "falsa salvia" and "salvia blanca". The corollas are said to have been "whitish" on Hatschbach 23841, "white" on Quarín & al. 1567, "yellow" on King & Bishop 7577, "yellowish" on Lourteig 2012, "white and orange" on Fiebrig 4452, and "rojiso purpurino pálido" on Steinbach 740. King & Bishop refer to the plant as "abundant spreading coarse herb".

Teague (1965) reports that the plant is "common" and ruderal in Paraguay, sometimes spreading to cotton or manioc fields, and cites Teague 267.

Additional citations: BRAZIL: Mato Grosso: Hatschbach 23841 (N), 39200 (Ld). BOLIVIA: Cochabamba: King & Bishop 7577 (W—2813112); R. F. Steinbach 740 (N, Ws). PARAGUAY: Fiebrig 4452 (Mu—4125), 5139 (Mu—4132); Lourteig 2012 (N); Montes 10996 (Mu); Quarín, Ishikawa, & Schinini 1567 (Ld); Schinini 9171 (Ld); Woolston 173 (N), 1637 (N). ARGENTINA: Corrientes: Burkart 19390 (N); Krapovickas & Cristóbal 11816 (W—2481392), 15792 (Ld, Ws). Misiones: Bertoni 2 [Herb. Inst. M. Lillo 99229] (Ut—3305458); T. Meyer 11378 (N); Montes 430b (N), 15091 (Ba), 27655 (Au—271297, Ld, N, W—2556006).

LIPPIA RECOLLETAE var. **PICKELII** (Moldenke) Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 47: 6792. 1966; Hocking, Excerpt. Bot. A.11: 450. 1967; Moldenke, Phytologia 14: 444. 1967; Moldenke, Fifth Summ. 1: 186 (1971) and 2: 563 & 894. 1971.

LIPPIA REHMANNI H. H. W. Pearson

Emended synonymy: Lippia rehmannii H. H. W. Pearson ex Moldenke, Résumé 316, in syn. 1959; Dyer, Verdoorn, Codd, & Letty, Wild Fls. Transv. 281. 1962.

Additional & emended bibliography: Rimington & al., Onderstepoort Journ. Vet. Sci. 9: 225—255. 1937; Roets, Onderstepoort Journ. Vet. Sci. 9: 583—588. 1937; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Karrer, Konstit. & Vork. Organ. Pflanzenst. 20 & 819. 1958; Anderson, De Kock, & Enslin, Journ. S. Afr. Chem. Inst. 14: 58. 1961; Dyer, Verdoorn, Codd, & Letty, Wild Fls. Transv. 281 & [282], pl. 140, fig. 4. 1962; Watt & Breyer-Brandwijk, Med. & Poison. Fl. S. & East. Afr., ed. 2, 479, 1049, 1050, 1052—1053, 1067, & 1410. 1962; H. K. Urban, Pharmazie 21: 336—339. 1966; Moldenke, Phytologia 14: 444. 1967; H. K. Urban, Bioresearch 1967: 1467. 1967; J. M. M. Br., Journ. S. Afr. Vet. Med. Assoc. 39 (3): 35—48. 1968; Anon., Biol. Abstr. 50 (1): S.107 (1969) and 50 (6): S.114. 1969; J. M. M. Br., Biol. Abstr. 50: 2969. 1969; Moldenke, Fifth Summ. 1: 230, 255, & 257 (1971) and 2: 536, 542, 551, 564, & 894. 1971; Boar & Allen, Phytochem. 12: 2575. 1973; Farnsworth, Pharmacog. Titles 8 (12): vii. 1973; Hegnauer, Chemotax. Pfl. 6 [Chem. Reihe 21]: 673—675. 1973; Moldenke, Phytologia 34: 261 (1976) and 39: 105. 1978.

Emended illustrations: Dyer, Verdoorn, Codd, & Letty, Wild Fls. Transv. [282], pl. 140, fig. 4 [in color]. 1962.

Recent collectors describe this plant as a rather spreading subshrub with a woody base and thick softish roots, the leaves pleasantly and strongly aromatic, and the flowers odorous, and have found it growing at altitudes of 1300—1400 meters. The corollas are said to have been "white" on Werderman & Oberdieck 1289 and "white to cream" on Winter 7518.

Smith (1966) records the vernacular names, "laventelbossie", "lekkerruickbossie", and "leventelbossie".

A notation on the label indicates that root material of Winter 7518 was collected for chemical analysis. Karrer (1958) reports that rehmannic acid or lantaden A, $C_{35}H_{52}O_5$, occurs in Lippia rehmanni as well as in Lantana camara and notes the presence of icterogenin A & C, $C_{35}H_{52}O_6$, only in Lippia rehmanni. Anderson and his associates (1961) report the presence of hederagenin (22 β angeloyloxy) and treleasegenic acid.

Watt & Breyer-Brandwijk (1962) assert that a condition almost indistinguishable from tribulosis and geeldikkop in sheep is caused by ingestion of the foliage of Lippia rehmanni (as well as those of Tribulus spp. and Panicum spp.), apparently due to the presence in the leaves of icterogenin A, B, & C and rehmannic acid mostly in the root bark but also in the leaves. They also report that in Vietnam the plant is used as a diuretic.

Brown (1968) describes the hematology and chemical pathology of icterogen from Lippia rehmanni intoxication in sheep, indicating typical intrahepatic cholestasis and severe photosensitivity. The main effects of icterogenin are on the membrane permeability, especially the liver cell membranes, with the membranes of the kidneys, muscle cells, and erythrocytes affected to a lesser degree. Urban (1966) states that the plant's extract can be used to induce triperpenoid icterogenin dermatological reversible jaundice in the treatment of psoriasis and bed sores in rats.

Some Pretoria botanists reduce L. rehmanni to the synonymy of L. wilmsii H. H. W. Pearson, but Pearson (1901) separates the three closely related taxa as follows:

Leaves crenate.....L. pretoriensis.
Leaves serrate.

Bracts 4 mm. or more in length.....L. wilmsii.

Bracts less than 4 mm. long.....L. rehmanni.

It should also be noted here that Codd 6554, originally distributed as L. rehmanni, is regarded by me as representing L. javanica (Burm. f.) Spreng. although it appears to match perfectly the photograph of the type specimen of L. rehmanni preserved in the New York Botanical Garden herbarium. Meeuse may be correct in his belief that the two taxa are conspecific.

Material of L. rehmanni has been misidentified and distributed in some herbaria as L. asperifolia Rich., L. wilmsii H. H. W. Pearson, Corchorus kirkii N. E. Br., and even Peucedanum caffrum Phillips. On the other hand, the Schweickhardt 1222, distributed as L. rehmanni, definitely is L. javanica (Burm. f.) Spreng. and Scheepers 1492 is L. scaberrima Sond.

Additional & emended citations: NAMIBIA: Baum 250 (F—photo, K, N, N—photo, Sg—photo, Z—photo). SOUTH AFRICA: Transvaal: Meebold 12830 (Mu); Werdermann & Oberdieck 1289 (W—2586066); Winter 7518 (Mu).

LIPPIA RETICULATA Hayek

Additional bibliography: Moldenke, *Phytologia* 12: 436—437. 1965; Moldenke, *Fifth Summ.* 1: 157 (1971) and 2: 894. 1971.

LIPPIA RHODOCNEMIS Mart. & Schau.

Additional synonymy: Lippia rhodocnemis Mart. ex Moldenke, *Phytologia* 36: 44, in syn. 1977.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Farl., *Proc. Am. Acad. Sci.* 18: 83. 1883; Speg., *Anal. Soc. Ci. Argent.* 17: 93. 1884; Sydow, *Monog. Ured.* 1: 309. 1902; Sydow, *Ann. Myc.* 5: 338. 1907; Speg., *Anal. Mus. Nac. Buenos Aires* 19: 313. 1909; H. S. Jacks., *Mycologia* 24: 64. 1932; Moldenke, *Phytologia* 12: 437—438. 1965; A. L. Moldenke, *Phytologia* 18: 121 & 123. 1969; Moldenke, *Fifth Summ.* 1: 157 (1971) and 2: 564 & 894. 1971; Troncoso, *Darwiniana* 18: 339 & 410. 1974.

Recent collectors have described this plant as a shrub, 2 m. tall, and have encountered it on outcrops in areas of campo on white sand and cerrado among outcrops, at 1200 m. altitude, flowering in March.

Jackson (1932) records the fungus, Puccinia lantanae Farl. (1883) from this host on the basis of Holway 1006 from Rio de Janeiro, Brazil, listing as synonyms P. accedens Sydow (1902), P. privae Sydow (1907), Uromyces lantanae Speg. (1884), and U. lippiae Speg. (1909).

The Tavares 630, distributed as L. rhodocnemis, actually is Lantana radula Sw.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28507 (Ld); Martius 1474 (Mu—123—type, Z—isotype). MOUNTED ILLUSTRATIONS: Schau. in Mart., *Fl. Bras.* 9: pl. 40. 1851 (N, Z).

LIPPIA RIEDELIANA Schau.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Moldenke, *Phytologia* 12: 439. 1965; Angely, *Fl. Anal. & Fitogeogr. Est. S. Paulo*, ed. 1, 4: 835 & xi. 1971; Moldenke, *Fifth Summ.* 1: 152 (1971) and 2: 894. 1971.

LIPPIA RIGIDA Schau.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; Moldenke, *Phytologia* 12: 439—440. 1965; Moldenke, *Fifth Summ.* 1: 157 (1971) and 2: 894. 1971.

Recent collectors describe this plant as a spindly erect shrub, 2—3 m. tall, with brittle erect or steeply ascending stems and branches, the leaves dark- or mid-green above, paler or gray-green beneath, strongly rugose, and the bracts pale-green. They have found it growing in burned-over grassland and in low woodland on sand with laterite, along a "small stream with marsh on white sand and surrounding cerrado on sandstone rock exposures", and "in damp open sandy areas and small streams with poorly developed gallery forest", at 950—1200 m. altitude, flow-

ering and fruiting in January and March. The corollas are said to have been "Cream-color" on Harley & al. 16708.

Additional citations: BRAZIL: Bahia: Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15602 (Z), 15756 (Ld), 16708 (Ac); Martius s.n. [in sylvis Catingas prope Maracas, Nov.; Macbride photo 20332] (Mu—124--type, Z--isotype).

LIPPIA RODRIGUEZII Moldenke

Additional bibliography: Moldenke, *Phytologia* 12: 440—441. 1965; Moldenke, *Fifth Summ.* 1: 199 (1971) and 2: 564 & 894. 1971; Troncoso, *Darwiniana* 18: 340 & 410. 1974.

This species has been encountered by recent collectors "entre el pasto", in anthesis in March, April, and September to January, in fruit in January. The corollas are said to have been "orange" on Schwarz 5114 and "yellow" on Schinini & al. 8344.

Through a typographic error, the surname "Schwarz" appears as "Schulz" in *Phytologia* 12: 441 (1965).

Additional citations: ARGENTINA: Corrientes: Schinini, Arbo, González, Ishikawa, & Tressens 8344 (Ld). Misiones: J. E. Montes 14764 (Au—271306, N, Z); G. J. Schwarz 1533 (Ms—34138), 4924 (N), 5030 (N), 5114 (N), 5398 (N), 5634 (N), 5782 (N).

LIPPIA RONDONENSIS Moldenke, *Phytologia* 20: 79. 1970.

Bibliography: Moldenke, *Phytologia* 20: 79. 1970; Anon., *Biol. Abstr.* 52 (3): B.A.S.I.C. S.134. 1971; Moldenke, *Biol. Abstr.* 52: 1316. 1971; Moldenke, *Excerpt. Bot.* A.18: 445. 1971; Moldenke, *Fifth Summ.* 1: 157 & 183 (1971) and 2: 894. 1971; Heslop-Harrison, *Ind. Kew. Suppl.* 15: 80. 1974; Moldenke, *Phytologia* 38: 398. 1978.

Recent collectors describe this plant as an herb or straggling shrub, 0.5—1 m. tall, and found it in flower in June and July. The corollas are said to have been "pale-violet" on Prance & al. 5847 and "lilac-pink, with yellow throat" on Prance & al. 5351.

Material of this species has been misidentified and distributed in some herbaria as L. alba (Mill.) N. E. Br., to which it is obviously closely related, and as Labiatae sp.

Citations: BRAZIL: Rondonia: Prance, Philcox, Forero, Coêlho, Ramos, & Farias 5351 (Ac, N); Prance, Forero, Wrigley, Ramos, & Farias 6761 (N--type, W--2571128A--isotype). BOLIVIA: Pando: Prance, Forero, Coêlho, Ramos, & Farias 5847 (Mu, N, W--2571127A).

LIPPIA ROSELLA Moldenke, sp. nov.

Suffrutex fragilis basaliter xylopodiiformis; caule solitario gracile usque ad 20 cm. alto tetragono dense puberulo stricto densissime folioso; foliis parvis arcte imbricato-adpressis ellipticis ca. 1 cm. longis 5 mm. latis apicaliter obtuso-subacutis basaliter truncato-subcordatis marginaliter regulariter serrulatis revolutis utrinque dense puberulis supra impresso-subbullatis; inflorescentiis solitariis apicaliter axillaribus; pedunculo gracile 1.8—2 cm. longo canescenti-puberulo; capitulis solitariis subglobosis multifloris ca. 1.5 cm. latis; bracteis involucriform-

ibus ovatis perconspicuis arcte imbricatis ca. 7 mm. longis 4 mm. latis apicaliter acutis vel brevissime acuminatis extus puberulis ciliatis.

A brittle subshrub rising from a woody xylopodium; stems usually solitary per season, very slender, about 20 cm. tall, tetragonal, strict and unbranched, densely puberulent throughout, densely leafy (except toward the base); internodes mostly quite regular and abbreviated, 1 cm. long or less; nodes slightly enlarged; leaves very numerous, closely antrorsely appressed and imbricate, very uniform, elliptic, small, about 1 cm. long and 5 mm. wide, apically obtuse or subacute, basally truncate or slightly subcordate, marginally regularly serrulate and revolute, densely puberulent on both surfaces, sessile; inflorescence solitary (per season), axillary toward the tip of the season's growth, ascending-erect; peduncles filiform, 1.8—2 cm. long, canescent-puberulent; head solitary, hop-like, small, subglobose, many-flowered, about 1.5 cm. long and wide; bracts forming a distinct basal involucre, large and conspicuous, apparently reddish or purplish when fresh, ovate, closely imbricate in many series, about 7 mm. long and 5 mm. wide, apically acute or very shortly cuspidate, marginally ciliate, externally puberulent; corolla hypocrateriform, rose-pink, its tube equaling the subtending bract, the limb 2—2.5 mm. wide.

The type of this curious little species was collected by H. S. Irwin, S. F. de Fonsêca, R. Souza, R. Reis dos Santos, and J. Ramos (no. 28442a) -- as a mixture with their no. 28442, L. hederæfolia Mart. & Schau. -- in cerrado in an area of cerrado and campo ca. 3 km. north of São João da Chapada, on the road to Inhaf, at 1200 m. altitude, in the Serro do Espinhaco, on the Planalto do Brasil, Minas Gerais, Brazil, on March 29, 1970, and is deposited in my personal herbarium.

Citations: BRAZIL: Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28442a (2—type).

LIPPIA ROSMARINIFOLIA Anderss., Ver. Akad. Handl. Stockh. 1853: 198. 1854.

Synonymy: Lippia rosmarinifolia var. rosmarinifolia Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 491 & 493, fig. 129c. 1971.

Additional & emended bibliography: Anderss., Vet. Akad. Handl. Stockh. 1853: 198. 1854; Hocking, Excerpt. Bot. A.12: 424. 1967; Moldenke, Phytologia 14: 414—415. 1967; Moldenke, Résumé Suppl. 15: 4. 1967; Colinvaux, Schofield, & Wiggins, Science 162: 1144. 1968; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 491—494, fig. 129c. 1971; Wiggins & Porter, Fl. Galáp. Isls. 253 & 989. 1971; Eliasson, Bot. Notiser 125: 53, 55, & 57. 1972; Balgooy, Pacif. Fl. Areas 3: 244. 1975; Van der Werff, Bot. Notiser 130: 96. 1977.

Illustrations: Moldenke in Wiggins & Porter, Fl. Galáp. 491, fig. 129c. 1971.

Howell refers to this plant as shrubby, 3—5 feet tall, the branches loosely spreading, the stems arching and growing toward the ground, and, when lodged in suitable crevices, rooting to form new

plants — if the stem does not root directly it creeps along the surface of the rock in prostrate condition. Wiggins & Porter describe it as a slender shrub, 2—3 m. tall, with more or less arcuate branches, while Wiggins & Duncan call it a slender tree, 8 m. tall, the trunk 1 dm. in diameter 1 m. from the ground.

The corollas are said to have been "pale creamy-yellow or flesh-color" on Howell 9448 and "white" on Wiggins & Porter 255. Collectors have found it growing on cinder ridges, at 125—470 m. altitude, flowering in January and May.

Fosberg describes the plant as a "shrub 1—2 m. tall (others seen tree-like, to 4 m.)", the flowers pinkish to yellowish-pink, and found it growing on the southwest slope of Narborough island, where it was "common in [a] broad green strip running from [the] summit to [the] sea, on well vegetated aa lava with pumice in the cavities", at 300 m. altitude, flowering in February. Eliasson found it at 400—450 m. altitude "among patches of old lava weathered into gravel with sparse vegetation, with Alternanthera filifolia, Froelichia nudicaulis ssp. lanigera, Jasminocereus thouarsii var. sclerocarpus, etc., and on caldera with such other dominant trees and shrubs as Bursera graveolens, Croton scouleri, Scalesia microcephala, and Macraea laricifolia; also on tufa cones". Wiggins & Porter (1971) report that it is sometimes host to Phoradendron henslovii (Hook. f.) Robinson.

Van der Werff (1977) feels that the stewartii form, which see, is only the juvenile form of the species.

The Howell 9585, distributed as typical L. rosmarinifolia, appears better regarded as f. stewartii (Moldenke) Moldenke.

Additional citations: GALAPAGOS ISLANDS: Albemarle: J. T. Howell 9448 (Gg—262952, Gg—462954, Gg—462966); Wiggins & Porter 255 (Z). James: Wiggins & Duncan 278 (W—2813285). Narborough: F. R. Fosberg 45014 (Ac).

LIPPIA ROSMARINIFOLIA var. LATIFOLIA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.12: 424. 1967; Moldenke, Phytologia 14: 415. 1967; Moldenke, Résumé Suppl. 15: 4. 1967; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 894. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 493 & 494. 1971; Wiggins & Porter, Fl. Galáp. Isls. 989. 1971; Vander Werff, Bot. Notiser 130: 96. 1977.

Wiggins & Porter describe this plant as a slender tree, 8 m. tall, with a trunk diameter to 10 cm. at 1 m. above the ground, growing on ridges at 470 m. altitude, flowering and fruiting in February. Vander Werff (1977) says "L. rosmarinifolia var. latifolia, described from Santiago, also has entire or obscurely toothed leaves when mature and lobed leaves when juvenile".

Additional citations: GALAPAGOS ISLANDS: James: Wiggins & Porter 278 (Z).

LIPPIA ROSMARINIFOLIA f. **STEWARTI** (Moldenke) Moldenke, stat. nov.

Synonymy: Lippia rosmarinifolia var. stewarti Moldenke, Phytologia 2: 415—416. 1948. Lippia rosmarinifolia var. stewartii Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 492 & 494. 1977.

Additional bibliography: Moldenke, Phytologia 14: 415. 1967; Moldenke, Fifth Summ. 1: 138 (1971) and 2: 564 & 894. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 492 & 494. 1971; Wiggins & Porter, Fl. Galáp. Isls. 989. 1971; Van den Werff, Bot. Notiser 130: 96. 1977.

Howell reports that the stems in this plant may layer (as they do on the typical form), the tips rooting when they touch the ground, creating a shrubby tangle difficult to traverse. He maintains that only the juvenile leaves are lobed, and found the plant growing at 2500 feet altitude. Actually, the type specimen, with distinctly pinnately lobed leaves, is in full anthesis, certainly not "juvenile" in the usual sense of that word. Van den Werff (1977) also feels that this form is not taxonomically valid. He says "Moldenke.....gives as diagnostic characteristics for var. rosmarinifolia: leaves entire or obscurely toothed. Var. stewartii is described as having pinnately lobed leaves. Howell, on the label of his collection.....states that the juvenile leaves are lobed. My own field observations confirm this: van der Werff 2337 is a juvenile, non-flowering plant from the coast below Volcán Alcedo, and has distinctly lobed leaves. All flowering Lippia plants in the area had entire leaves. Apparently L. rosmarinifolia keeps the lobed leaves longer on the top of the volcanoes than in the coastal areas, but such plants with juvenile, lobed leaves do not deserve taxonomic recognition."

Additional citations: GALAPAGOS ISLANDS: Albemarle: J. T. Howell 9585 (Gg—462946, Gg—462947).

LIPPIA ROTUNDIFOLIA Cham.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 471. 1904; Moldenke, Phytologia 12: 443—445. 1965; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 543, 564, 568, & 894. 1971; Troncoso, Darwiniana 18: 339 & 410. 1974; Moldenke, Phytologia 31: 385 (1975) and 39: 162. 1978.

Recent collectors describe this plant as a shrub or small subshrub, 0.5—2 m. tall, erect, or as an "herb with rather lignified shoots to 1.5 m." long, the leaves apically acute or subacute, and have found it growing in red sandy loam or vermilion soil, in rocky campo, cerrado, cerrado with many shrubs, tall savanna woodland, "cerrado woodland on deep red latosol", and in moist parts of campo near roadways, at 1050—1100 m. altitude, flowering in May, June, and August to October, and fruiting in June, September, and October. The corollas are said to have been "lilac" on Hatschbach 36987 and Taxonomy Class Univ. Bras. 92, "pale-lilac" on Murça Pires 57939, "rose" on Hatschbach 27021 & 29926, and "mauve-purple with yellow throat" on Ratter & al. 2600.

Peckolt (1904) reports that L. rotundifolia is used as an aromatic in parts of Brazil.

Material of this species has been misidentified and distributed in some herbaria as L. lacunosa Mart. & Schau. or as Hyptis sp. On the other hand, the W. R. Anderson 9747, Hunt & Ramos 6256, A. Lutz 1095, Martius s.n. [in campis editis deserti, Jul. 1818], Murça Pires, Silva, & Souza 9409, and Pohl s.n. [in Brasilia], distributed as L. rotundifolia, are all L. lacunosa Mart. & Schau., while Carmo & Macedo s.n. [Macedo 5411] is Hyptis sp. in the Lamiaceae.

Additional citations: BRAZIL: Distrito Federal: Hatschbach 36987 (Ld); Lindeman & Haas 6031 (Ld); Ratter, Fonsêca, & Castro R.2600 (N); Taxonomy Class Univ. Bras. 92 (W-2757739). Minas Gerais: Duarte 8079 [Herb. Jard. Bot. Rio Jan. 122466] (N); Hatschbach 27021 (Ld, N, W-2744641), 29926 (Ld, N); Macedo 3773 (E-1647189); Martius 1036 (Mu-126, Mu-127), s.n. [in campis ad fl. Arassuahy et prope Munbucas in desertis] (Mu-125); Murça Pires 57939 (N, W-2571101A). MOUNTED ILLUSTRATIONS: Schau. in Mart., Fl. Bras. 9: pl. 39 (sin.). 1851 (N, Z).

LIPPIA RUBIGINOSA Schau.

Additional bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Moldenke, Phytologia 14: 415. 1967; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 835 & xi. 1971; Moldenke, Fifth Summ. 1: 157 (1971) and 2: 564, 565, & 894. 1971; Moldenke, Phytologia 25: 229. 1973; Troncoso, Darwiniana 18: 337. 1974.

Troncoso (1974) cites this species as the lectotype of the Section Goniostachyum Schau., a section which she fully describes there and circumscribes geographically. The Angely (1971) reference in the bibliography above is often cited by the incorrect title-page date "1970".

Recent collectors describe L. rubiginosa as a shrub, 1 m. tall, and have encountered it on the "outer edge of river terraces along shore, top edge of terrace before few-meter descent to river", at 150 m. altitude, flowering in February. They report the vernacular name, "alecrim". The corollas are said to have been "white" on Eiten & Eiten 10730.

Additional citations: BRAZIL: Maranhão: Eiten & Eiten 10730 (N, W-2700166).

LIPPIA RUGOSA A. Chev.

Additional & emended bibliography: Meikle in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 432, 436, & 437. 1963; Hepper, Bull. Inst. Fond. Afr. Noire 27: 419 & 495. 1965; Moldenke, Phytologia 14: 412 & 415-416. 1967; Moldenke, Résumé Suppl. 15: 7. 1967; Moldenke, Fifth Summ. 1: 217, 222, & 224 (1971) and 2: 894. 1971; Moldenke, Phytologia 39: 31 & 181. 1978.

Hepper (1965) tells us that this plant is "common in disturbed areas" on the savannas of Northern Nigeria, where the stems are

used as faggots, for building purposes, and in the manufacture of beds. He gives its distribution as "in uplands of Guinea, N. Nigeria, E. & W. Nigeria, and W. Cameroon".

Meikle (1963) reduces to synonymy here the "L. adoensis of F. W.T.A., ed. 1, 2: 270, partly, not of Hochst." and L. nigeriensis Moldenke. He cites the following specimens from the Kew herbarium: GUINEA: Chevalier 20410. NORTHERN NIGERIA: Coombe 9, Hepper 1892, Latilo FHI.37974, Lely 582, MacGregor 429, Meikle 824, Monod 9361 & 9872. SOUTHERN NIGERIA: Hambler 585. CAMEROONS: Hepper 1269, Keay FHI.28522, Latilo & Daramola FHI.28795, Maitland 1697. It has been collected in anthesis from September to January and in fruit in December and January.

LIPPIA RZEDOWSKII Moldenke

Additional bibliography: Moldenke, Biol. Abstr. 47: 6794. 1966; Moldenke, Phytologia 13: 367. 1966; Hocking, Excerpt. Bot. A.11: 103. 1967; Heslop-Harrison, Ind. Kew. Suppl. 15: 80. 1974.

LIPPIA SALAMENSIS Loes.

Additional bibliography: Moldenke, Phytologia 12: 448--449. 1965; Gibson, Fieldiana Bot. 24 (9): 207 & 213. 1970; Moldenke, Fifth Summ. 1: 80 (1971) and 2: 894. 1971.

Gibson (1970) feels that L. jurgenseni Briq. may be conspecific with L. salamensis, but I regard it as a synonym of L. pringlei Briq.

LIPPIA SALICIFOLIA Anderss.

Additional bibliography: Moldenke, Phytologia 14: 415 & 416. 1967; Moldenke, Fifth Summ. 1: 138, 183, & 186 (1971) and 2: 894. 1971; Moldenke in Wiggins & Porter, Fl. Galáp. Isls. 492--494. 1971; Wiggins & Porter, Fl. Galáp. Isls. 989. 1971; Balgooy, Pacific Fl. Areas 3: 244. 1975.

LIPPIA SALSA Griseb.

Additional bibliography: V. J. Chapm., Salt Marshes & Salt Deserts, ed. 1, 265 & 381. 1960; Ruiz Leal, Revist. Facult. Cienc. Agrar. Mendoza 11: 170, 172, & 173, fig. 7. 1964; Moldenke, Phytologia 12: 450--452. 1965; Ruiz Leal, Biol. Abstr. 49: 3256. 1968; Moldenke, Fifth Summ. 1: 199 (1971) and 2: 894. 1971; V. J. Chapm., Salt Marshes & Salt Deserts, ed. 2, 265 & 381. 1974; Troncoso, Darwiniana 18: 334, 338, & 410. 1974.

Additional illustrations: Ruiz Leal, Revist. Facult. Cienc. Agrar. Mendoza 11: 172, fig. 7. 1964.

Recent collectors describe this plant as a subshrub, 30 cm. tall, with spreading branches, and have encountered it at 240 m. altitude, flowering in January.

Troncoso (1974) cites Covas 18541 in the San Isidro herbarium and gives the distribution of the species in Argentina as Córdoba, Santiago del Estero, Tucumán, La Rioja, and Mendoza. The corollas are said to have been "white" on Cabrera & al. 16651 and on Krapo-

vickas & Cristóbal 17766.

Additional citations: ARGENTINA: Córdoba: Cabrera, Solbrig, Torres, & Vuillemier 16651 (S); Ellenberg 4410 (Ld). Mendoza: Krapovickas & Cristóbal 14569 (Z); Rufz Leal 9099 (Tu—162096); Semper s.n. [5/III/1944] (N). Santiago del Estero: Krapovickas & Cristóbal 17766 (Ld); T. Meyer 12800 (N).

LIPPIA SALVIAEFOLIA Cham.

Additional & emended bibliography: Buek, Gen. Spec. Syn. Candoll. 3: 266. 1858; Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 4: [1155]—1156. 1904; Briq. in Chod. & Hassl., Pl. Hassler. 2: [481]—492. 1904; R. C. Foster, Contrib. Gray Herb. 184: 170. 1958; Moldenke, Phytologia 14: 416. 1967; Moldenke, Résumé Suppl. 15: 21. 1967; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 835, 836, & xi. 1971; Moldenke, Fifth Summ. 1: 157 & 199 (1971) and 2: 549, 563, 565, 566, & 894. 1971; Moldenke, Phytologia 24: 136. 1972; Troncoso, Darwiniana 18: 335, 337, & 410. 1974; Moldenke, Phytologia 39: 82. 1978.

Recent collectors refer to this plant as a shrub, 0.8—3 m. tall, or branched and subprostrate, the stem to 2 cm. in diameter 1 m. above the ground, and the flowers fragrant. They have found it growing in rocky soil, cerrado, and among cutover cerrado vegetation, as well as on roadside banks in cerrado areas, at 500—1200 m. altitude, flowering from February to April and in November and December. Anderson and his associates encountered it "in forest in areas of sloping rocky cerrado bordered by forest along streams and by grassy recently burned campo, in sandy soil and sandstone".

The corollas are said to have been "white" on Anderson & al. 36169, Eiten & al. 6026, Fiebrig 4234, Hassler 6720, Pereira 10760, Schulz 7107, and Schwarz 3456, "white, the tube yellow within" on Irwin & al. 28042, and "cream-white" on Leitão & al. 4301.

The Angely (1971) reference cited in the bibliography above is sometimes cited as published in 1970, the erroneous titlepage date. This author recognizes both L. polycephala Briq. and L. salviaefolia Cham. as distinct species; for the former he gives the distribution as Paraguay, Piauí, Minas Gerais, and São Paulo and for the latter Mato Grosso, Minas Gerais, and São Paulo. I regard the two taxa as conspecific. Troncoso (1974) cites Martínez Crovetto 9754 from Misiones in the San Isidro herbarium and gives the geographic distribution of the species as "Brasil austral, Paraguay, Bolivia y NE Argentina: Misiones".

Material of L. salviaefolia has been misidentified and distributed in some herbaria as Lantana sp. and as "Lippia mollis Mart. var." On the other hand, the Martius s.n. [in pascuis ad V. N. da Rainha, Mart.], distributed as L. salviaefolia, is the type collection of L. grata Schau.

Additional citations: BRAZIL: Mato Grosso: Martius 1032 (Mu—127, Mu—1218, Z). Minas Gerais: Anderson, Stieber, & Kirkbride 36169 (Ld, N, W—2709300); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28042 (Ld). São Paulo: Eiten, Eiten, & Mimura 6026 (N, W—2687156); I. S. Gottsberger 47 [8] (Ld), 136 [8] (Ld); Labouriau 57 (W—2548179); Leitão & al. 4301 (N); E. Pereira 10760 [Herb. Brad. 52686] (Mp). PARAGUAY: Fiebrig 4234 (Mu—4148); Hassler 6720 (Ca—944346); Schinini 4349 (Ld). ARGENTINA: Misio-
nes: A. G. Schulz 7107 (N); G. J. Schwarz 3456 (N), 5733 (N).

LIPPIA SANDWITIIANA Moldenke

Additional bibliography: Moldenke, *Phytologia* 12: 456—457. 1965; Moldenke, *Fifth Summ.* 1: 186 (1971) and 2: 894. 1971.

LIPPIA SATUREIAEFOLIA Mart. & Schau.

Synonymy: Lippia satureiaefolia Mart. & Schau. ex Solered., *Syst. Anat. Dicot. Ergänzt.* 255. 1908. Lippia saturaeaeefolia Mart. ex Moldenke, *Phytologia* 36: 44, in syn. 1977.

Additional bibliography: Buek, *Gen. Spec. Syn. Candoll.* 3: 266. 1858; T. Peckolt, *Bericht. Deutsch. Pharm. Gesell.* 14: 470. 1904; Solered., *Syst. Anat. Dicot. Ergänzt.* 255. 1908; J. F. Macbr., *Field Mus. Publ. Bot.* 13 (5): 649. 1960; Moldenke, *Phytologia* 12: 457—458. 1965; Moldenke, *Fifth Summ.* 1: 157 (1971) and 2: 894. 1971; Moldenke, *Phytologia* 23: 433. 1972.

Peckolt (1904) records the vernacular name, "alecrim do mato" (which he translates as "wilder Rosmarin"), for this species.

Additional citations: BRAZIL: Minas Gerais: Martius 1377 [Macbride photos 20333] (Mu—128—type, Z—isotype).

LIPPIA SAVORYI Meikle

Additional & emended bibliography: Meikle in Hutch. & Dalz., *Fl. W. Trop. Afr.*, ed. 2, 2: 432, 436, & 437. 1963; Townsend, *Excerpt. Bot. A.7:* 364. 1964; Moldenke, *Phytologia* 14: 417. 1967; Moldenke, *Résumé Suppl.* 15: 6. 1967; G. Taylor, *Ind. Kew. Suppl.* 14: 79. 1970; Moldenke, *Fifth Summ.* 1: 220, 222, 231, & 244 (1971) and 2: 549, 560, 568, & 894. 1971; Hagnauer, *Chemotax. Pfl.* 6 [Chem. Reihe 21]: 661. 1973; Moldenke, *Phytologia* 38: 263 & 266 (1978) and 39: 31, 32, 80, 91, 92, & 181. 1978.

Recent collectors describe this plant as a small, erect, pale-green perennial or annual herb, 12—16 inches tall, strongly aromatic (but not of lemons) and have encountered it on flats of red loamy sand and on dry Acacia savannas, at 2800 feet altitude, flowering in February, March, October, and November, fruiting in March, October, and November. The corollas are said to have been "white" on Merxmüller & Giese 666 and "creamy-white" on Noel 2403. Leistner refers to it as "occasional" in the Transvaal. Kinges notes of his no. 1869 that the leaves are narrower than in no. 1868 and that "the herbs have an overall different appearance". Meikle (1963) notes that the species is related to L. chevalierii Moldenke.

[to be continued]

LABIATAE IN NICARAGUA

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To report the specimens collected in Nicaragua by my associates and myself is the primary purpose of this article. At the same time, collections by other botanists are listed, so far as they have come to my knowledge, in order to give a fuller account of Nicaragua.

The keys here presented, like those in similar articles by the same author, listed at the conclusion, are the products of his own efforts in identifying specimens from Nicaragua. In the Labiatae, corollas and stamens are fundamental for classification. However, in the fruiting stage, those parts may not be present, or even if present, they may be so small or shriveled that it is difficult to observe their characters. This is likely to be true especially in pressed specimens. Although the following keys are intended for use when flowering characters are not present, they may be used also for flowering specimens. Consequently a few flowering characters are provided. At the same time, some taxonomic treatment which gives fuller descriptions is needed. Entered in the annotated lists of species are a few descriptive notes.

Some of the genera and species included are not yet known in Nicaragua, but are known in some other country in Central America. Who can predict which of them will at some time be found in Nicaragua? For this reason, all those known in Central America are here treated.

I wish to express my thanks to the following: Dr. Willard W. Payne and Dr. Daniel B. Ward and his staff of the University of Florida. Dr. Lyman B. Smith and Dr. David B. Lellinger of the United States National Herbarium. Dr. Reed C. Rollins, Director of the Gray Herbarium. Dr. Richard A. Howard, Director of the Arnold Arboretum. Mr. Ray Angelo, for many valuable notes. I am deeply indebted to the authors listed in the bib-

liography at the end of this article or cited in connection with a particular genus.

Brief description of the Labiatae, the Mint Family. Herbs or shrubs or, very rarely, trees, often with 4-sided stems. Leaves opposite or more than 2 at a node, simple, entire or toothed or narrowly lobed; without stipules. Inflorescences various, axillary or terminal; flowers commonly in clusters (verticels). Calyx united at base, 5-toothed or 2-lipped or 8-10-toothed, persistent. Corolla regular or irregular, 4-5-toothed or 2-lipped, united at base. Stamens 2-4, with rudiment often present. Pistil 1; stigma 2-lobed. Ovary and fruit superior, 4-lobed, forming 4, 1-seeded nutlets.

ARTIFICIAL KEY TO GENERA OF LABIATAE
known to occur in Central America.

- A. Plant rarely blossoming; stem sparsely branched, sparsely hairy or almost glabrous; stolons leafy; blades glandular-dotted beneath, 3-5 cm long, toothed 16. Mentha citrata Ehrh.
- A. Plant blossoming or fruiting B.
 - B. Calyx-teeth 8 or 10, spine-tipped C.
 - C. Calyx-teeth 10 (in ours), almost equal, hooked at tip, throat densely white; flowers sessile or nearly so p. 7
 4. Horehound, Marrubium vulgare L.
 - C. Calyx-teeth 8, unequal, not hooked at tip, throat not white; pedicels 1-2 mm long, p. 7
 6. Leonotis nepetaefolia (L.) R. Br.
 - B. Calyx-teeth not more than 5; calyx variously toothed or lobed D.
 - D. Calyx 2-lipped or teeth unequal E.
 - E. Inflorescences in axils of leaves, sometimes also terminal; flowers in clusters, racemes or spikes F.
 - F. Calyx hairy in throat, 10-13-nerved, all 5 lobes slender, hairy G.
 - G. Plant dwarf, matted; blades 5-9 mm long, entire, glandular-punctate; stamens 4, p. 28
 14. Thyme, Thymus vulgaris L.
 - G. Plant not dwarf, not matted; blades 7-20 cm long, dentate, not punctate; fertile stamens 2, p. 26.
 11. Hedeoma costatum Hemsley
 - F. Calyx glabrous in throat; fertile stamens 2 H.
 - H. Leaves linear, entire, revolute; plant a shrub, . . .
 p. 5 2. Rosmarinus officinalis L.
 - H. Leaves usually toothed, usually not revolute;
 plant an herb or shrub, some species of 9. Salvia

- E. Inflorescences (in ours) terminal on main branch or side-branches, not in axils of leaves I.
- I. Flowers in dense heads, a pair of leaves at base of head; lower lip of calyx with 2 lanceolate sharp teeth; upper lip wide, very shallowly toothed, p. 75. Heal-all, Prunella vulgaris L.
- I. Flowers in slender spike or raceme or panicle J.
- J. Flowers erect or ascending, only in age sometimes reflexed; calyx 2-lipped K.
- K. Calyx-lips entire, closed after flowering; pedicels 2-6 mm long; stamens 4, p. 5 3. Scutellaria
- K. Calyx lips, 1 or both toothed; flowers sessile or on short pedicels; calyx open after flowering; stamens 2, p. 10. . . . some species of 9. Salvia
- J. Flowers not erect, not ascending; stamens 4 L.
- L. Margins of upper lip of calyx decurrent on tube; upper lip entire, lower lip 4-toothed; corolla-tube straight; calyx not gland-dotted, p. 40.20. Basil, Ocimum
- L. Margins of upper lip of calyx not decurrent on tube M.
- M. Upper lip of calyx entire, lower lip 4-toothed; flowers sessile, on long leafless peduncle, p. p. 41.21. Catopheria
- M. Upper lip of calyx 3-toothed, lower lip 2-toothed; corolla-tube curved; calyx gland-dotted; pedicels 1.5-2.5 mm long; flowers turned sidewise or downward, p. 39. . . 19. Coleus
- D. Calyx not 2-lipped or only slightly so; calyx-teeth equal or nearly so N.
- N. Blades deeply lobed; flower-clusters dense, axillary; calyx-teeth spine-tipped, p. 8 . 7. Leonurus sibiricus L.
- N. Blades toothed or entire, not lobed O.
- O. Inflorescence spreading almost horizontally; flowers in short axillary racemes; calyx-lobes widely spreading, not tubular; stamens 4; plant a shrub, p. 27.13. Chaunostoma mecisandrum Donn. Sm.
- O. Inflorescence erect or ascending; calyx usually tubular R.
- P. Calyx 13-15-nerved; flowers on pedicels Q.
- Q. Calyx hairy, white-hairy in throat; flowers mostly above uppermost leaves; fertile stamens 2 . . p. 28.15. Cunila polyantha Bth.
- Q. Calyx glabrous, pilose or glabrous in throat; flowers solitary in axils of full-sized leaves; stamens 4, p. 27.12. Satureja

P. Calyx 10-nerved; flowers often sessile; stamens 4 R.

R. Calyx in fruit 10-12 mm long; pedicels 2-3 mm long;
flower-clusters distant; calyx-teeth spine-tipped, p.25
..... 10. Lepechinia

R. Calyx in fruit 1.5-8 mm long S.

S. Calyx widened (inflated) in fruit, teeth triangular or
ovate; flowers terminal on main stem or branches,
lower ones sometimes acillary; calyx 2.5-7 mm
long, not gland-dotted, lobes unequal, p.4
..... 1. Teucrium

S. Calyx not widened in fruit, not inflated, lobes nearly
equal. See combined key to Hyptis, Lepechinia,
Marsypianthes, Mentha and Stachys, p. 29.

1. TEUCRIUM Linnaeus

Herbs, ours. Leaves, in ours, toothed. Flowers usually 2
in a cluster, axillary or terminal, in heads, racemes or spikes.
Calyx 5-toothed, 10-nerved, puberulent, sometimes also pilose,
teeth equal or unequal. Corolla slightly 2-lipped. Stamens 4,
in pairs, anther-cells divergent. Nutlets obovoid, rugose.

A. Stem distinctly 4-angled, almost winged, sparsely hairy; ca-
lyx puberulent, not pilose, tubular, 2.5-5 mm long; corolla
5-10 mm long 1. Teucrium proctori L. Wms.

A. Stem bluntly angled, densely pilose with spreading curved
hairs; calyx puberulent and with long spreading hairs, cam-
panulate, 5-7 mm long; corolla purple, 9-11 mm long
..... 2. Teucrium vesicarium Mill.

1. Teucrium proctori L. Wms., Fieldiana. Bot. 34:114. 1972.
Guatemala. Type: Nebay, Proctor 25498.

2. Teucrium vesicarium Miller, Gard. Dict. ed. 8, no. 17. 1768.
Illustr., Fl. Panama 56:107. 1969; Fl. Guatemala 9:315. 1973.

Teucrium inflatum Sw., Prodr. Veg. Ind. Occ. 88. 1788.
S. Mexico, British Honduras, Guatemala, Honduras, Nicar-
agua, Costa Rica, Panama, W. I., Jamaica (FLAS), S. A.

2. ROSMARINUS Linnaeus

Rosemary

Evergreen shrub. Leaves narrow, entire. Flowers almost
sessile in axillary racemes. Calyx 2-lipped, upper 3-toothed,
lower 2-toothed. Corolla 2-lipped, upper notched or 2-cleft, low-
er 3-lobed. Perfect stamens 2. Nutlets almost globose, smooth.

1. Rosmarinus officinalis L., Sp. Pl. 23. 1753.

Leaves linear, margins revolute, obtuse, tomentose beneath.

Corolla 10-12 mm long. Florida (FLAS), Europe (FLAS).

3. SCUTELLARIA Linnaeus

Skullcap

Herbs (ours) or shrubs. Leaves entire or dentate. Inflorescence a spike or raceme or rarely a panicle, or in axils of leaves. Calyx cup-shaped, 2-lipped; dorsal lip with rounded appendage; lips entire, closed after flowering. Corolla long-tubular, 2-lipped. Stamens 4. Nutlets usually tuberculate or hispid.

A. Petioles 1-5 mm long; blades 1-5 cm long B.

B. Stem glabrous; blades hastate-cordate at base; calyx 2 mm long; corolla blue or purple, 3-4 mm long 1. Scutellaria racemosa Pers.

B. Stem hairy; blades not hastate; calyx 3-5 mm long; blades obtuse or almost obtuse at tip C.

C. Stem hirsute; blades 2-3 cm long, almost orbicular, obtuse; corolla 2.5-3 cm long 2. Scutellaria lundellii Epling

C. Stem finely hairy or hairy only on angles; calyx 3-4 mm long; corolla 1.5-2.5 cm long D.

D. Stem densely finely velutinous; corolla yellow; pedicels 3-6 mm long . 3. Scutellaria lutea Donn. Sm.

D. Stem sparsely hairy on angles only; hairs curved upward; corolla violet 4. Scutellaria dumetorum Schlecht.

A. Petioles 5-30(-40) mm long E.

E. Blades coarsely serrate or crenate-dentate F.

F. Blades gray-hairy above and beneath; calyx 1.5-4 mm long; corolla purple, 13-14 mm long 5. Scutellaria guatemalensis Leonard

F. Blades glandular-hairy on nerves beneath, otherwise glabrous; stem and calyx glandular-hairy; corolla crimson, 4-5 cm long . . . 8. Scutellaria argentata Leonard

E. Blades sinuate-dentate or almost entire G.

G. Blades rounded or obtuse or acute at tip; corolla 10-15 mm long H.

H. Calyx sparsely hairy; petioles 10-20 mm long; stem densely hairy; hairs recurved 7. Scutellaria purpurascens Sw.

H. Calyx densely hairy; petioles 5-12 mm long; stem finely hairy . . . 6. Scutellaria seleriana Loesener

G. Blades acuminate or rarely acute at tip I.

I. Stem puberulent at least in upper part. commonly 1 m tall; calyx puberulent; corolla red J

- J. Blades almost cordate at base, 8-12 mm long; petioles 1.7-3.5 cm long; corolla 4-5 cm long, glabrous or nearly so. 9. Scutellaria costaricana Wendland
- J. Blades cuneate at base, 4-10 cm long; petioles 1-4 cm long; corolla 2.4-4 cm long, puberulent 10. Scutellaria longifolia Bth.
- I. Stem pilose; blades acute to acuminate at tip, rounded to widely cunate at base K.
- K. Calyx densely pilose; blades 7-12 cm long, densely softly pilose beneath; corolla red, 4 cm long 11. Scutellaria inflata Epling
- K. Calyx puberulent or glabrate; blades 2-8 cm long, puberulent or short-villous especially on nerves beneath; corolla 1.9-2.4 cm long . . 12. Scutellaria orichalcea Donn. Sm.
1. Scutellaria racemosa Pers., Syn. Pl. 2:136. 1807.
Scutellaria lewisiana Nowicke, Phytologia 18:419. 1969.
 Illustr., Fl. Panama 56:102. 1969.
 Alabama (FLAS), central & southern Mexico, Honduras, Panama, S. A.
 2. Scutellaria lundellii Epling, Lilloa 4:267. 1939.
 British Honduras.
 3. Scutellaria lutea Donn. Sm., Bot. Gaz. 13:76. 1888.
 Guatemala.
 4. Scutellaria dumetorum Schlechter, Linnaea 7:400. (before Feb.) 1832. Central & southern Mexico, Guatemala, Fl. Guatemala 9:305. 1973.
 5. Scutellaria guatemalensis Leonard, Contr. U. S. Nat. Herb. 22:715. 1927. Scutellaria purpurascens Sw. var. heterophylla Bth. Very similar to Scutellaria seleriana Loesener. Mexico. Guatemala, Fl. Guatemala 9:305. 1973.
 6. Scutellaria seleriana Loesener, Bull. Herb. Boiss. 7:568. 1899. Calyx including teeth 1-2 mm long.
 S. Mexico, Guatemala, Fl. Guatemala 9:309. 1973.
 7. Scutellaria purpurascens Sw., Prodr. Veg. Ind. Occ. 89. 1788. Guatemala, Costa Rica, Panama, W. I., Colombia, Venezuela (FLAS), Brazil, Fl. Guatemala 9:308. 1973.
 8. Scutellaria argentata Leonard, Journ. Wash. Acad. Sci. 17:170. 1927. Costa Rica.
 9. Scutellaria costaricana Wendland, Hamb. Gart. Zeit. 19:29. 1863. Petioles of longer leaves 1.7-3.5 cm long. Costa Rica.
 10. Scutellaria longifolia Bth. in Lindley Bot. Reg. 18: sub.t. 1493. 1832. Illustr., Fl. Guatemala 9:307. 1973.
Scutellaria glabra Leonard, Contr. U. S. Nat. Herb. 22:715. 1927. Mexico, Guatemala, Salvador, Costa Rica, Fl. Guatemala 9:306. 1973.

11. Scutellaria inflata Epling, Lilloa 4:270. 1939. May be a synonym of Scutellaria longifolia Bth., Fl. Guatemala 9:306. 1973. British Honduras, Guatemala.
12. Scutellaria orichalcea Donn. Sm., Bot. Gaz. 14:29. 1889. Mexico, British Honduras, Costa Rica, Fl. Guatemala 9:308. 1973.

4. MARRUBIUM Linnaeus

Horehound

Herbs. Leaves dentate, in ours, or lobed. Flowers in axillary clusters. Calyx 5-10-toothed, 5-10-nerved, teeth equal or unequal, often spreading or recurved. Corolla 2-lipped, upper lip entire or slightly 2-lobed, the lower spreading, 3-lobed. Stamens 4, anther-cells divaricate. Nutlets ovoid, smooth.

1. Marrubium vulgare L., Sp. Pl. 583. 1753.

United States, Florida, Mexico (FLAS).

5. PRUNELLA Linnaeus

Heal-all

Herbs, low (ours) to decumbent or prostrate. Leaves on petioles, entire or toothed or pinnatifid. Flowers in dense terminal or sometimes axillary heads. Bracts wide. Calyx 2-lipped, reticulate-veined. Corolla 2-lipped, upper lip erect, entire, lower lip 3-lobed. Stamens 4. Nutlets flattened, ovoid, smooth. See Rhodora 15:179. 1913.

1. Prunella vulgaris L., Sp. Pl. 600. 1753.

Plants sprawling, branched at base, branches about 30 cm long. Leaves 3-8 cm long, obtuse or almost acute, rounded to acute at base, entire or slightly toothed. Flowers sessile in dense heads. Calyx upper lip faintly 3-lobed, lower lip 2-toothed. United States, Florida, Mexico, Costa Rica, W. I., Europe (FLAS).

6. LEONOTIS Robert Brown

Herbs, rarely shrubs. Leaves dentate. Petioles long. Flowers in very dense axillary clusters. Calyx with 8-10 unequal sharp-tipped teeth, 10-nerved. Corolla 2-lipped, tube curved, upper lip erect, lower 3-lobed. Stamens 4; anther-cells divergent. Nutlets 3-angled, smooth.

1. Leonotis nepetifolia R. Br. in Aiton Hort. Kew. ed. 2. 3:409. 1811. Illustr., Fl. Guatemala 9:260. 1973.

Pedicels 1-2 mm long. Corolla scarlet or orange, 2-2.5 cm long.

Florida, Mexico, W. I. (FLAS).

7. LEONURUS Linnaeus

Herbs. Leaves sharply lobed. Petioles long. Flowers in dense axillary clusters. Calyx with 5 almost equal, sharp-tipped teeth, 5-nerved. Corolla 2-lipped, tube straight, upper lip erect, entire, lower spreading, 5-lobed. Stamens 4; anther-cells usually parallel. Nutlets 3-angled, smooth.

1. Leonurus sibiricus L., Sp. Pl. 587. 1753. Illustr., Flora Guatemala 9:260. 1973. Leaves lobed. Corolla purple-red, 8-12 mm long. Adventive from Eurasia. United States, Florida (FLAS), Cuba (FLAS), Jamaica (FLAS), Europe.

Nicaragua:

Jinotega, Jinotega. Grant 7285 (GH).

Matagalpa, Sebaco. Atwood 2490 (VT); Mena 2514 (GH, MO).

Boaco, Camoapa. Atwood 3472 (VT); Seymour 3491 (NY, UC, WDP).

Teustepe. Atwood 2420a (F, SEYM).

Granada, Mombacho. Grant 765 (GH).

8. STACHYS Linnaeus

Herbs. Leaves on petioles or almost sessile. Flower-clusters in axils of leaves or bracts, or upper ones without leaves or bracts. Blades often cordate at base. Calyx-lobes equal or nearly equal, sometimes spine-tipped, tube 3-7 mm long. Corolla distinctly 2-lipped, upper lip 2-lobed, lower 3-lobed. Stamens 4; anthers divergent or parallel. Nutlets obovate, smooth or roughened.

Stachys is distinguished from Hyptis and Marsypianthes by the stamens ascending under the upper lip of the corolla, whereas in Hyptis and Marsypianthes, the stamens are declined toward the lower lip. In Stachys the corolla is strongly 2-lipped, in Hyptis slightly 2-lipped. From Lepechinia, Stachys differs in having stamens and style exerted from the corolla, whereas in Lepechinia, they are not exerted. In Stachys and Lepechinia, the lower lip of corolla is plane; in Hyptis and Marsypianthes, it is saccate.

A. Blades almost sessile, very obtuse at tip; calyx 4.5-6 mm long, lobes not spine-tipped; corolla 6-9 mm long 1. Stachys callicola Epling

A. Blades on long slender petioles; blades rounded or truncate or heart-shaped at base B.

B. Hairs of stem long, spreading, usually dense; calyx 3-7 mm long C.

- C. Leaves thinly hirsute above and beneath; calyx long-hirsute; corolla purplish, tube 5-7 mm long
 2. Stachys guatemalensis Epling
- C. Leaves thinly to densely pilose above and beneath; stems densely pilose with spreading hairs; calyx pilose D.
- D. Plant annual; flowers in clusters of 6-12; blades 1.5-5 cm long; corolla pink or purple, 2.5-4 cm long 3. Stachys agraria C. & S.
- D. Plant annual; flowers in clusters of 6; blades 3-8 cm long; corolla red, tube 18-21 mm long
 4. Stachys coccinea Jacq.
- B. Hairs of stem usually recurved or short-pilose E.
- E. Blades 5-13 cm long, acute or acuminate; calyx 9.5-11.5 mm long; corolla red, 18-23 mm long; plant climbing 5. Stachys lindenii Bth.
- E. Blades 2-5 cm long; calyx 4.5-5.5 mm long; plant procumbent or clambering F.
- F. Calyx 6-8 mm long, pilose; corolla-tube 6-8 mm long 6. Stachys pittieri Briq.
- F. Calyx 4.5-5.5 mm long G.
- G. Calyx short-hirtellous, 5-5.5 mm long; corolla pink tube 5-6 mm long . . 7. Stachys costaricensis Briq.
- G. Calyx densely softly pilose, 4.5-5 mm long in flower; corolla purple, tube 12-14 mm long
 8. Stachys nubilorum Epling
1. Stachys calcicola Epling, Bull. Torr. Bot. Club 71:484. 1944. Guatemala.
2. Stachys guatemalensis Epling, Rep. Sp. Nov. Beih. 80:34. 1934. Illustr., Fl. Guatemala 9:313. 1973.
 Mexico, Guatemala, Honduras, Nicaragua, Fl. Guatemala 9:312. 1973. Nicaragua, Chontales, Acoyapa. Marshall & Neill 6531 (SEYM).
3. Stachys agraria C. & S., Linnaea 5:100. 1830.
 S. United States, Mexico, Guatemala, Honduras, Fl. Guatemala 9:310. 1973.
 Nicaragua: Nueva Segovia, Plan Grande. Seymour 5147 (SEYM).
 Best distinguished from Stachys coccinea Jacq. by the corollas.
4. Stachys coccinea Jacq., Pl. Hort. Schoenbr. 3:18, t. 284. 1798. Sw. United States, Mexico, Guatemala, Nicaragua, Fl. Guatemala 9:311. 1973.
5. Stachys lindenii Bth. in DC. Prodr. 12:467. 1848.
 S. Mexico, Guatemala, Fl. Guatemala 9:312. 1973.

6. Stachys pittieri Briq., Ann. Conserv. Geneve 2:119. 1898.
Endemic in Costa Rica.
7. Stachys costaricensis Briq., Bull. Soc. Bot. Belg. 30:240.
1891. Illustr., Fl. Panama 56:110. 1969.
Costa Rica (FLAS), Panama.
8. Stachys nubilorum Epling, Rep. Sp. Nov. Beih. 80:48. 1934.
Guatemala. Type: Santa Elena, Skutch 209.
Closely allied to Stachys coccinea Jacq., which has spreading
hairs on the stem. In Stachys nubilorum Epling, hairs of
stem are retrorse.

9. SALVIA Linnaeus

Herba or shrubs. Leaves entire or toothed in Central America, elsewhere in some species incised or pinnatisect. Flowers in dense globose heads or in clusters, on pedicels or sessile, axillary or terminal. Calyx 2-lipped, upper entire or 3-toothed, lower 2-cleft, throat naked, Corolla 2-lipped, upper erect-concave, entire or notched, lower spreading, 3-toothed. Perfect stamens 2. Nutlets ovoid, smooth, 3-angled or compressed.

Salvia is an unusually difficult genus because of much variability of characters in some species. Often leaves and stem may be either hairy or glabrous; and the calyx varies in length more than usual because of its lengthening in fruit. The species in this genus appear to be the product of an extensive series of hybridizations.

Unless otherwise stated, measurements of leaves apply to the largest leaves, not to the much smaller leaves which often occur.

- A. Bracts of inflorescence ovate or wider, usually persistent, sometimes kidney-shaped, usually conspicuous, sometimes obscuring calyces B. cp. p. 12
 - B. Calyx red or reddish or bluish or purple, at least 6-20 mm long C. cp. p. 11
 - C. Flowers on pedicels; longest pedicels 6-15 mm long or longer; corolla reddish, tube 18-34 mm long; usually a shrub D.
 - D. Stem puberulent; calyx hispidulous, without long tail-like tip, about 9 mm long; bracts long-persistent, purplish; corolla purple, about 18 mm long; pedicels up to 6 mm long, p. 24. 33. Salvia guarinae Standley
 - D. Stem tomentose to glabrous; calyx villous to puberulent, at least 12-15 mm long; corolla reddish, 19-34 mm long; blades tomentose beneath; usually shrub E.
 - E. Stem tomentose throughout; calyx 13-16 mm long after flowering, puberulent or villosulous, with long tail-like tip at flowering time; bracts of in-

- florescence falling very early; corolla reddish, tube 19-25 mm long; pedicels 10-15 mm long, p. 20 . . .
 5. Salvia karwinskii Benth.
 E. Stem glabrous below, hairy in upper part; calyx red, villous, without tail-like tip, at least 14-15 mm long; bracts of inflorescence red, villous; corolla red to rose, tube 22-34 mm long; pedicels 2-10 mm long, p. 21 6. Salvia wagneriana Polak.
 C. Flowers sessile or nearly so F. cp. p. 10
 F. Calyx scarlet, 15-20 mm long; blades rounded at base; bracts scarlet; corolla scarlet, tube 30-40 mm long; annual, p. 21 12. Salvia splendens R. & S.
 F. Calyx purple or bluish, at least 6-10 mm long; shrub G.
 G. Calyx bluish, at least 6-7 mm long, hispidulous or hirsute, usually viscid; blades usually subtomentose beneath; bracts 1.2-1.6 cm wide; corolla blue, tube 5-6.5 mm long, p. 22 18. Salvia rubiginosa Benth.
 G. Calyx purple, at least 10 mm long, puberulent on nerves; blades glabrous; bracts 1-3 cm long, deciduous; corolla pink to rose, tube 16-17 mm long, p. 22 16. Salvia grandis Epling
 B. Calyx green or whitened, 5-14 mm long H. cp. p. 10
 H. Blades glabrous or nearly so, or thinly scabrous above; bracts entire I.
 I. Calyx 5-7.5 mm long in fruit, narrowed to tail-like tip; tip 2 mm long; calyx with glandular hairs; blades puberulent beneath on nerves, 5-18 cm long; bracts 1-2 cm long, deciduous; corolla red, tube 15-25 mm long; herb cp. p. 19, 21 . . 10. Salvia cinnabarina Mart. & Gal.
 I. Calyx 11-14 mm long, glabrous, without tail-like tip J.
 J. Blades softly pilose beneath, 7-9 mm long, veins elevated, reticulate; stem with spreading hairs; corolla purple, tube 18-21 mm long; shrub; cp. p. 16, 21 8. Salvia opertiflora Epling
 J. Blades glabrous beneath, 10-15 cm long; stem glabrous; bracts reddish, falling early; corolla scarlet, tube 20-27 mm long; herb or shrub, p. 14, 22 15. Salvia miniata Fern.
 H. Blades hairy above; flowers sessile or on very short pedicels; bracts persistent K.
 K. Bracts of inflorescence finely toothed, 8-10 mm wide; bracts 8-10 mm wide; corolla blue, tube 2-3.5 mm long; herb L.
 L. Calyx sparsely pilose on nerves; bracts sparsely pilose; blades 1.5-3.5 cm long; petioles 1-1.5 cm long; calyx about 8 mm long, p. 22 14. Salvia fracta L. Wms.

- L. Calyx densely villous-hirsute with white hairs or almost glabrous; bracts villous-hirsute, 8-10 mm wide; blades 2-6 cm long; petioles 1.5-2.5 cm long on lower leaves; calyx at least 3.5-4.5 mm long, p. 22 17. Salvia hypnoides Mart. & Gal.
- K. Bracts of inflorescence not toothed M.
- M. Calyx in fruit not over 3 mm long, glandular-hairy; blades obtuse or acute, 2-6 cm long; corolla blue, tube 2.5 mm long; stem prostrate at base; herb, p. 19. 1. Salvia occidentalis Sw.
- M. Calyx 5.5-11 mm long in fruit N.
- N. Bracts heart-shaped at base, acuminate, as wide as long, bluish or reddish, much longer than calyces; blades 4-10 cm long, hairy or almost glabrous above and beneath, attenuate at base; calyx 5.5-7.5 mm long; corolla blue to violet, tube 6-8 mm long, p. 22. 13. Salvia mocinoi Bth.
- N. Bracts not heart-shaped at base O.
- O. Calyx 1-2 mm long after flowering, up to 8 mm long in fruit, glandular hispidulous, teeth with spine-like tips; blades 1.5-3.5 cm long, acute or obtuse; bracts lanceolate, persistent; corolla blue, tube 2.5-3 mm long; herb, procumbent or decumbent, . . . p. 20 2. Salvia misella HBK.
- O. Calyx 8-11 mm long in fruit; blades 4-12 cm long, acute or acuminate P.
- P. Calyx densely white-hirsute; blades 5-8 cm long, densely hairy above and beneath; bracts ovate, abruptly narrowed to long awl-like tip; corolla blue, tube 4.5-5.5 mm long; erect annual, p. 21. 9. Salvia hispanica L.
- P. Calyx hairy to glabrous, not whitened; blades soft-hairy above, white-tomentose beneath; bracts as wide as long; corolla purplish, tube 7.5-9 mm long long; shrub, p. 22 19. Salvia shannonii Donn. Sm.
- A. Bracts of inflorescence narrow or falling early and thus appearing absent, lanceolate to setaceous, never rounded or kidney-shaped, inconspicuous, not obscuring calyx; cp. p. 10
- Q. Calyx made white or yellowish or purplish by hairs R.
cp. p. 13
- R. Calyx densely white-hirsute, at least 12 mm long in fruit; stem white-hirsute; blades obtuse to rounded at tip, white-tomentose beneath, rounded to almost heart-shaped at base; corolla rose-purple, tube 12 mm long; herb, p. 22. 20. Salvia leucochlamys Epling
- R. Calyx variously hairy but not hirsute S.

- S. Calyx stellate-tomentose with yellowish or purplish hairs, 10-15 mm long after flowering; blades truncate to rounded at base, 3-7(-13) cm long; corolla red, tube 8-10 mm long; shrub, p. 22 .21. Salvia lasiantha Bth.
 S. Calyx without stellate hairs T.

T. Blades rounded at base, acuminate at tip, 6-12 cm long; calyx whitish-hirtellous or woolly, at least 4-9 mm long; pedicels 2-4 mm long; corolla purple, tube 10-18 mm long; herb, p. 23 25. Salvia purpurea Cav.

T. Blades acute to attenuate at base, 3-9 cm long U.

U. Calyx 13 mm long, woolly; pedicels 4 mm long; corolla red, tube included in calyx; tending to be shrubby; blades 8 cm long, p. 22 22. Salvia pittieri Briq.

U. Calyx 4-8 mm long; flowers sessile or nearly so; blades 3-9 cm long; corolla blue; Herb V.

V. Stem leafless on upper part; leaves all near base; calyx densely white-tomentose, at least 5-8 mm long, teeth short, obtuse; pedicels 1-2(-3) mm long; corolla-tube 6-9 mm long, p. 23 27. Salvia farinacea Bth.

V. Stem leafy above base; calyx often whitish-striose to nearly glabrous, 4-5.5(-7) mm long, lobes narrowly triangular, short-attenuate; flowers sessile or nearly so; corolla-tube 3.5-4.5 mm long; petioles of larger leaves 1-5(-10) mm long, p. 23 23. Salvia lavanduloides HBK.

Q. Calyx not made white or yellowish or purplish by hairs W. cp. p. 12

W. Stem leafless on upper part; leaves all near base; blades 4-9 cm long; calyx 5-8 mm long, glandular-hispidulous or hirtellous, with black glands; flowers sessile; blades glabrous above; corolla violet, tube 5-6 mm long; herb, p. 23 28. Salvia nana HBK.

W. Stem leafy above base; flowers sessile or on pedicels X.

X. Flowers sessile Y. cp. p. 14

Y. Blades glabrous beneath or nearly so; corolla scarlet Z.

Z. Calyx scarlet, inflated, in flower 20 mm long; larger blades 6-9 cm long, 4-5.5 cm wide, rounded at base; corolla-tube 30-40 mm long, p. 21 12. Salvia splendens R. & S.

- Z. Calyx green, not inflated, 11-14 mm long; blades 10-15 cm long, 3-6 cm wide, acute or attenuate at base; corolla-tube 20-27 mm long; p. 22 15. Salvia miniata Fern.
- Y. Blades hairy beneath at least at base or on nerves Aa.
 Aa. Calyx glandular-hispidulous, 1-2(-8) mm long, teeth with spine-like tips, p. 20 2. Salvia misella HBK.
 Aa. Calyx not glandular-hispidulous Ab.
 Ab. Calyx villous, 2.5-5 mm long; pedicels 0.5-2 mm long; petioles of larger leaves 2-4 cm long, p. 23 26. Salvia polystachya Ortega
 Ab. Calyx not villous Ac.
 Ac. Calyx 4-5.5(-7) mm long, nearly glabrous or hairs appressed; petioles 1-5(-10) mm long, p. 23 23. Salvia lavanduloides HBK.
 Ac. Calyx at least 8 mm long, glabrous or nearly so; petioles 1-5 cm long, p. 23 32. Salvia kellermanii Donn. Sm.
- X. Flowers on pedicels; pedicels 1-10 mm long, usually 5-7 mm long Ad. cp. p. 13.
 Ad. Blades linear, 2-8 cm long, 1.5-5 mm wide, entire or nearly so; calyx 2-3 mm long; corolla blue, tube 7-10 mm long; herb, p. 24 34. Salvia leptophylla Benth.
 Ad. Blades wider, lanceolate to ovate; pedicels 1-8 mm long Ae.
 Ae. Blades glabrous or nearly so beneath when mature Af. cp. p. 16
 Af. Blades hairy above, sometimes dotted beneath, sometimes sparsely scabrous Ag. cp. p. 15
 Ag. Blades sagittate-cordate at base; calyx glandular-villous, 5 mm long; corolla blue, about 10 mm long; herb, p. 24 35. Salvia costaricensis Oersted
 Ag. Blades not sagittate Ah.
 Ah. Calyx glabrous, 8 mm long; corolla white, tube about twice as long as calyx; blades attenuate to base; pedicels sometimes 8 mm long; tending to be shrubby, p. 24 36. Salvia drymocharis Epling
 Ah. Calyx hairy at least on nerves Ai.
 Ai. Calyx 4-8 mm long, green, hairy on nerves only; pedicels 1-3 mm long; blades 4-6 cm long, sparsely hairy on both surfaces or almost glabrous; corolla blue or white, 4-10 mm long, p. 24 37. Salvia tiliaefolia Vahl
 Ai. Calyx 9-18 mm long in fruit, purplish; corolla purplish; blades 7-15 cm long; racemes interrupted; pedicels 4-13 mm long Aj.

- Aj. Blades rounded or heart-shaped at base, glabrous beneath, dotted beneath with minute yellowish glands, above with short harsh hairs; calyx 9-11 mm long at flowering time, sparsely villous; corolla-tube 20-25 mm long; herb, p. 25 44. Salvia recurva Bth.
- Aj. Blades cuneate-attenuate at base, glabrous or nearly so; calyx in fruit 17 mm long, densely short-puberulent; corolla 4 cm long; shrub, p. 25. 42. Salvia bella Briq.
- Af. Blades glabrous above and beneath Ak. cp. p. 14
- Ak. Calyx glandular-hairy Al.
- Al. Blades acute or acuminate; axis of inflorescence glandular-hairy; blades shallowly or deeply heart-shaped at base, 5-10 cm long; pedicels 2-6 mm long; corolla red, tube 20-23 mm long, p. 20 . . 4. Salvia holwayi Blake
- Al. Blades obtuse or rounded at tip; axis of inflorescence not glandular-hairy; blades truncate at base, 1.5-4.5 cm long; longest petioles 1.2-1.8 cm long; calyx at least 3.5-5.5 mm long, in fruit 6-8 mm long; pedicels 1-3 mm long; corolla usually blue, tube 4-6 mm long, p. 21 11. Salvia micrantha Vahl
- Ak. Calyx not glandular Am.
- Am. Calyx blue or violet or purple or reddish, at least 9-14 mm long, 9-18 mm long in fruit; blades glabrous or slightly hairy on veins beneath An.
- An. Racemes 5-10 cm long; plant almost glabrous throughout; petioles 5 mm long; blades 10-20 cm long; calyx at least 10 mm long, dark-purple, hispidulous on nerves only; corolla deep-purple, tube 15-17 mm long, p. 25 41. Salvia pansamalensis Donn. Sm.
- An. Racemes 20-40 cm long; stem hispidulous; petioles 2-6 cm long; blades 6-12 cm long; calyx at least 12-14 mm long, reddish, hispidulous; corolla red, tube 24 mm long; pedicels 6-7 mm long, p. 25 45. Salvia subrubens Epling
- Am. Calyx green, 5.5-8 mm long; pedicels 1-4 mm long Ao.
- Ao. Blades 2-3.5 cm long, 2 cm wide; petioles 1-4 cm long; corolla rose, 13-15 mm long, p. 25 43. Salvia trichopes Epling
- Ao. Blades 4-11 cm long, 5 cm wide; corolla blue Ap.
- Ap. Blsdes long-attenuate at base, to 8 cm long, 5 cm wide; petioles winged; pedicels 2-4 mm long; calyx 4-5 mm long; corolla white to blue, 5-6 mm long; herb, p. 24 38. Salvia longimarginata Briq.

- Ap. Blades rounded-truncate, usually abruptly decurrent at base; petiole not winged except at summit; corolla blue Aq.
- Aq. Blades 4-6 cm long; calyx hispidulous on nerves only, at flowering time 7 mm long; petioles 1-5 cm long; corolla blue, tube 16-24 mm long; herb, p. 24 37. Salvia tiliaefolia Vahl
- Aq. Blades 6-11 cm long; petioles 1-3.5 cm long; corollablue Ar.
- Ar. Pedicels 2-4 mm long; calyx 5.5-8 mm long; clusters 6-12-flowered; racemes 7-10 cm long; corolla 7-10 mm long; herb or shrub, p. 24 39. Salvia pteroura Briq.
- Ar. Pedicels 8-10 mm long; calyx at least 11-12 mm long; clusters mostly 3-flowered; racemes 20-40 cm long; corolla-tube 17-18 mm long; shrub, p. 25 46. Salvia phaenostemma Donn. Sm.
- Ae. Blades hairy beneath at least on veins As. cp. p. 14
- As. Blades hastate-cordate at base; calyx at least 4-10 mm long; flowers remote, not clustered; corolla blue, tube 16-22 mm long; herb, p. 25 47. Salvia cacaliaefolia Bth.
- As. Blades not hastate, sometimes cordate At.
- At. Stem with long spreading hairs; calyx green Au.
- Au. Hairs of stem brown; pedicels 4-5 mm long; calyx glabrous, in flower 12 mm long; blades scabrous above, soft-hairy beneath, p. 21 8. Salvia opertiflora Epling
- Au. Hairs of stem white; calyx densely hairy; blades hairy above and beneath Av.
- Av. Calyx at least 20 mm long; blades 7-14 cm long; corolla rose-red, 5-6 cm long; pedicels 6-8 mm long; herb, p. 25 . 52. Salvia dorisiana Standley
- Av. Calyx at least 7-12 mm long; pedicels 2-5(-8) mm long; blades usually heart-shaped at base Aw.
- Aw. Blades pilose above, whitish-tomentose beneath, 5-15 cm long; calyx at least 7-12 mm long, viscid-hirsute; axis of raceme viscid-pilose with long spreading hairs; corolla violet or blue, tube 8-15 mm long, p. 25 51. Salvia urica Epling
- Aw. Blades densely soft-hairy above and beneath, 3-6 cm long; calyx at least 7-8 mm long, densely hirtellous; corolla scarlet, tube 13-20 mm long, p. 25 . 53. Salvia coccinea Murray
- At. Stem variously hairy, not with long spreading hairs; blades 2-15 cm long Ax.

- Ax. Blades shallowly or deeply heart-shaped at base; corolla red; blades widely ovate; pedicels 2-7 mm long; herb or shrub, erect or climbing or reclining Ay.
- Ay. Flower-clusters in axils of leaves; calyx 12-17 mm long, green or purple; corolla 25-35 mm long; shrub or woody vine, p. 23 29. Salvia disjuncta Fern.
- Ay. Flower-clusters in racemes; racemes up to 20 cm long Az.
- Az. Calyx green, 7-14 mm long at flowering time; axis of densely glandular-hairy; corolla 20-23 mm long; stem erect or not, p. 20 4. Salvia holwayi Blake var. puberulenta L. Wms.
- Az. Calyx purplish, 13 mm long; axis of inflorescence not glandular-hairy; corolla 30 mm long; stem erect; herb, p. 25 54. Salvia iodochroa Briq.
- Ax. Blades rounded to acute or attenuate or truncate at base Ba.
- Ba. Flowers in axils of leaves, in clusters or dense racemes which are shorter than leaves Bb.
- Bb. Stem densely pilose; flowers in clusters or on short branches; blades 3-9 cm long, 1.5-3 cm wide, densely or sparsely hairy above and beneath, sessile or petioles 3-5 mm long; corolla-tube 15 mm long; shrub, p. 23 30. Salvia alariformis L. Wms.
- Bb. Stem appressed-hairy or glabrate; racemes dense, 3-10 cm long; blades 5-12 cm long, largest 5-7 cm wide, almost glabrous above and beneath, hirtellous on veins beneath; petioles 3-8 mm long; pedicels 2-4 mm long; corolla-tube 13 mm long; herb or somewhat woody, p. 23 31. Salvia maxonii Epling
- Ba. Flowers terminal, in spikes or racemes which are longer than leaves Bc.
- Bc. Calyx 10-20 mm long in fruit Bd. cp. p. 18
- Bd. Calyx red or reddish, 12-15 mm long; hairs of leaves branched Be. cp. p. 18
- Be. Stems tomentose throughout; pedicels mostly 10-15 mm long; calyx puberulent or villosulous and hispidulous, 13-16 mm long after flowering; bracts falling very early; blades 5-14 cm long, tomentose beneath; corolla red, tube 19-25 mm long; usually shrub, p. 20 5. Salvia karwinskii Bth.
- Be. Stems glabrous below, hairy in upper part; pedicels 3-8 mm long; calyx villous; bracts red; corolla red to rose, tube 22-34 mm long; blades 8-13.5 cm long, 3.5-7 cm wide; shrub, p. 21 6. Salvia wagneriana Polak.

- Bd. Calyx greenish, at least 10-15 mm long; pedicels 2-5 mm long Bf. cp. p. 17
- Bf. Blades 1-2.5 cm long, usually obtuse at tip, acute or obtuse at base, with tiny resin globules above and beneath, scabrous on veins beneath, otherwise glabrous; calyx glandular; pedicels 2-5 mm long; corolla rose-red, 16-18 mm long; petioles of larger leaves 7-27 mm long; herb or shrub, p. 24 40. Salvia microphylla HBK.
- Bf. Blades 3-20 cm long, acute or acuminate at tip Bg.
- Bg. Calyx glandular-pilose, at least 11 mm long; blades puberulent on veins beneath, almost glabrous, cuneate at base, 3-8 cm long; axis of inflorescence glandular-pilose; corolla white and purplish, tube 14-17 mm long; herb, p. 25 . . . 50. Salvia flaccida Fern.
- Bg. Calyx not glandular, 10-17 mm long; blades villous beneath and usually above, 5-20 cm long, rounded or obtuse at base; corolla red Bh.
- Bh. Calyx hispidulous; corolla-tube 25-27 mm long; blades 8-20 cm long; herb, p. 20
- 3. Salvia curtiflora Epling
- Bh. Calyx hirtellous and puberulent, margins of lobes densely white-puberulent; corolla-tube 33-34 mm long; blades 5-10 cm long; shrub. p. 21 7. Salvia excelsa Bth.
- Bc. Calyx 4-8(-10) mm long in fruit Bi. cp. p. 17
- Bi. Calyx 4.5 mm long; blades acute to attenuate at base, narrow, 1.5-2.5 cm long, 3-6 mm wide, 4-5 times as long as wide; pedicels 2-3 mm long; herb, p. 25
- 49. Salvia fratrurn Standley
- Bi. Calyx 7-10 mm long; blades obtuse or rounded or truncate at base, at least lower leaves thus Bj.
- Bj. Stem tomentose as well as hirsute; blades acute or acuminate at tip, hirsute to glabrous above, tomentose beneath; calyx 8-10 mm long; veins elevated on young blades; longest petioles 1.5-1.7 cm long; corolla purple or magenta, tube 10-12 mm long; shrub. p. 25
- 55. Salvia areolata Epling
- Bj. Stem pilose, not tomentose, not hirsute Bk.
- Bk. Calyx hairy, not glandular, at least 7-8 mm long Bl. cp. p. 19
- Bl. Blades 3-4 cm long, hirtellous above and beneath; petioles 5-6 mm long; racemes 3-4 cm long, interrupted; pedicels 5 mm long; corolla purple, tube 12 mm long; stem suffrutescent, p. 25 48. Salvia sparsiflora Epling

- B1. Blades 4-6 cm long, sparsely hairy above and beneath or glabrous; petioles 1-5 cm long; racemes 15-30 cm long; pedicels 1-3 mm long; corolla blue, tube 4 mm long; herb; cp. pp. 16, 24 37. Salvia tiliaefolia Vahl
- Bk. Calyx glandular-hairy; herb Bm.
- Bm. Blades 5-18 cm long, acute to acuminate at tip; axis of inflorescence densely finely hairy, often glandular; pedicels 1-6 mm long; calyx 5-8 mm long Bn.
- Bn. Blades puberulent or nearly glabrous above, puberulent on nerves beneath; calyx extended into tail-like tip, tip 2 mm long; calyx in age 5-6 mm long; corolla red, tube 15-25 mm long, p. 21 10. Salvia cinnabarina Mart. & Gal.
- Bn. Blades villosulous above and beneath; calyx not extended into tail-like tip; calyx 6-8 mm long after flowering; corolla purple to white, tube 7-10 mm long, p. 23 24. Salvia gracilis Bth.
- Bm. Blades 1.5-4.5 cm long; corolla blue Bo.
- Bo. Blades puberulent or hirtellous on veins beneath, obtuse or rounded at tip; petioles 1.2-1.8 cm long; corolla-tube 4-6 mm long; calyx in fruit 6-8 mm long, p. 21 11. Salvia micrantha Vahl
- Bo. Blades sparsely villous or hirsute above and beneath, acute or obtuse at tip; calyx after flowering 1-2 mm long; corolla-tube 2.5-3 mm long; cp. p. 14, 20 2. Salvia misella HBK.

1. Salvia occidentalis Sw., Prodr. Veg. Ind. Occ. 14. 1788.

Salvia obscurum Bth., Lab. Gen. & Sp. 245. 1833.

Florida (FLAS), Mexico, British Honduras to Salvador and Panama, W. I., S. A., Fl. Guatemala 9:293. 1973.

Nicaragua:

Zelaya, Corn Is. Nelson 4367 (B, DUKE, ENAG, FLAS, MSC, SEYM),

Siuna. Atwood 3179 (MO, SEYM).

Nueva Segovia, Dipilto. Marshall 6396 (ENAG).

Plan Grande. Nelson 5122 (ENAG, SEYM, US, YU).

Matriz, Yalaguina. Hamblett 931 (BM, ENAG, F, GH, MICH, MO, NY, SEYM, SMU, UC, WDP);
Moore 940 (FLAS, NY); Seymour 965 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).

Esteli, Mechapa. Atwood 986 (SEYM); Dudgey 1027 (MO, UC).

1. Salvia occidentalis Sw., cont.

Boaco, Boaco. Nichols 1476 (SEYM); Seymour 3866 (BM).

Chontales, Acoyapa. Dudey 1670 (ENAG, SEYM, SMU, WDP);

Nichols 1739 (SEYM);

Marshall & Neill 7079 (SEYM).

Juigalpa. Nichols 1643 (SEYM, WDP).

Chinandega, Chinandega. Baker 130, 2036 (GH).

Managua, Tipitapa. Hamblett 10 (BM, ENAG, F, GH, SMU);

Zelaya 47 (SEYM).

Managua?, Sierra de Managua. Grant 1026, 1055 (GH).

Granada, Volcan Mombacho. Nichols 2006 (NY, SEYM).

Carazo, Santa Teresa. Dudey 1286 (BM, DUKE, ENAG, F,

FLAS, GH, MICH, MO, NY, SEYM,

SMU, UC, WDP, WIS);

Nichols 1317 (SEYM).

Rivas, La Virgen. Hamblett 1203 (UC); Seymour 1238 (VT).

Penas Blancas. Narvaez 1836 (BM, ENAG, F, GH, MO,

NY, SEYM, SMU, UC, WDP, WIS).

2. Salvia misella HBK., Nov. Gen. & Sp. Pl. 2:290. 1817.

Salvia riparia HBK., Nov. Gen. & Sp. Pl. 2:300. 1817,

syn. nov.

Calyx after flowering 1-2 mm long.

Mexico, Central America, W. I. to Peru, Gulf of Fonseca.

Nicaragua:

Managua, Managua. Garnier A1382 (GH).

Between Managua and Sabana Grande.

Greenman & Greenman 5684 (GH).

Chinandega, Gulf of Fonseca. May be in Nicaragua (GH).

3. Salvia curtiflora Epling, Fedde Rep. Sp. Nov. Beih. 110:340.

1939. Guatemala. Calyx after flowering 10-17 mm long.

4. Salvia holwayi Blake, Proc. Biol. Soc. Wash. 33:113. 1920.

Type: Volcan de Agua, Holway 579.

Pedicels 2-6 mm long.

a. Leaves glabrous; Mexico, Guatemala var. holwayi

a. Leaves densely or sparsely puberulent

. var. puberulenta L. Wmsl.

Fl. Guatemala 9:286. 1973.

5. Salvia karwinskii Bth., Lab. Gen. & Sp. 725. 1835.

Salvia siguatepequensis Standley, Journ. Arnold Arb. 11:40.

1930.

Calyx after flowering 13-16 mm long.

S. Mexico, Guatemala, Honduras, Salvador, Nicaragua, Fl. Guatemala 9:287. 1973.

6. Salvia wagneriana Polak., *Linnaea* 41:591. 1877.
 Illustr., *Fl. Panama* 57:80. 1969.
Salvia tonduzii Briq., *Ann. Conserv. Jard. Bot. Geneve*
 2:157. 1898.
 Larger leaves 8-13.5 cm long, 3.5-7 cm wide. Pedicels 3-8
 mm long.
 Guatemala, Salvador, Nicaragua, Costa Rica, Panama (FLAS),
Fl. Guatemala 9:300. 1973.
 Nicaragua:
 Jinotega, Ocotillo near Santa Lastenia. Williams et alii 27847
 (GH).
7. Salvia excelsa Bth. in *Lindley Bot. Reg.* 27:90. 1841.
 Pedicels 2-5 mm long.
 S. Mexico, Guatemala, *Fl. Guatemala* 9:282. 1973.
8. Salvia opertiflora Epling, *Bull. Torr. Bot. Club* 68:568. 1941.
 Guatemala. Known only from the type, Steyermark 31469.
 We have seen no specimen of this species.
9. Salvia hispanica L., *Sp. Pl.* 25. 1753.
 Florida (FLAS), central & southern Mexico, Guatemala, Sal-
 vador, *Fl. Guatemala* 9:284. 1973.
 Nicaragua: Nueva Segovia, Plan Grande. Nelson 5129 (SEYM).
 Granada, Granada. Baker 4866 (GH).
10. Salvia cinnabarina Mart. & Gal., *Bull. Acad. Brux.* 11,
 part 2:63. 1844. Illustr., *Fl. Guatemala* 9:279. 1973.
 Pedicels 2-4 mm long. Calyx with glandular hairs. S. Mexico,
 Guatemala, Honduras salvador, *Fl. Guatemala* 9:279. 1973.
11. Salvia micrantha Vahl, *Enum. Pl.* 1:235. 1805.
 Longest petioles 1.2-1.8 cm long. Pedicels 1-3 mm long.
 Florida (FLAS), Yucatan, Honduras, Panama, W. I., *Fl.*
Guatemala 9:291. 1973.
 Nicaragua:
 Nueva Segovia, Ocotal. Nichols 832 (VT).
 Chontales, Juigalpa. Hamblett 1615 (BM, ENAG, F, GH, MO,
 SEYM, SMU, UC, WDP).
 Leon, Telica. Dudey, Hamblett & Nichols 202 (VT).
 Managua, Managua. Dudey, Hamblett & Nichols 185 (BM,
 ENAG, F, GH, MO, SEYM, SMU).
 Masaya, Lake Masaya. Hamblett 83 (ENAG, GH, NY, SEYM,
 SMU).
 Rivas, La Virgen. Atwood 1181 (VT).
12. Salvia splendens Sellow, ex Roemer & Schultes, *Syst. Veg.*
Mant. 1:185. 1822.
 Larger blades 6-9 cm long, 4-5.5 cm wide. Flowering calyx 2
 cm long. Florida (FLAS), Guatemala, Salvador, Brazil,
Fl. Guatemala 9:298. 1973.

13. Salvia mocinnoi Bth., Lab. Nov. Gen. & Sp. 271. 1833.
Corolla sky-blue to violet.
Mexico (GH), Honduras, Salvador, Fl. Guatemala 9:292. 1973.
Nicaragua:
Nueva Segovia, Jalapa. Atwood, Marshall & Neill 6821 (BM,
ENAG, F, FLAS, GH, MO, NY, SEYM, SMU,
UC).
Jinotega, Jinotega. Grant 7286 (GH).
14. Salvia fracta L. Wms., Fieldiana, Bot. 34:110. 1972.
Guatemala. Type: Williams, Molina & Williams 26069.
15. Salvia miniata Fern., Proc. Amer. Acad. 35:545. 1900.
Veins of blades not elevated as in Salvia disjuncta.
Mexico, British Honduras, Guatemala, Fl. Guatemala 9:
292. 1973.
16. Salvia grandis Epling, Bull. Torr. Bot. Club 71:492. 1944.
Guatemala. Type: Steyermark 43047.
We have seen no specimen of this species.
17. Salvia hyptoides Mart. & Gal., Bull. Acad. Brux. 11, 2:74.
1844. Illustr., Fl. Panama 56:75. 1969.
Flowers sessile. Mexico to Panama, n. S. A.
Nicaragua:
Zelaya, Madregara. Seymour 3276 (MO, SEYM).
Nueva Segovia, Jalapa. Atwood, Marshall & Neill 6821 (BM,
ENAG, F, FLAS, GH, MO, MSC, NY,
SEYM, SMU, UC).
Ocotul. Dudey 784 (SEYM); Hamblett 799
(ENAG, WIS); Nichols 825a (B, MICH);
Seymour 862 (ENAG).
Chontales, Acoyapa. Nichols 1738 (F, SEYM).
Leon, Telica. Dudey, Hamblett & Nichols 204 (BM, ENAG, GH,
SEYM, SMU).
- Managua, El Crucero. Atwood & Neill 6763 (SEYM).
18. Salvia rubiginosa Bth. in DC. Prodr. 12:301. 1848.
Bracts 9-15 mm long, 12-16 mm wide.
S. Mexico, Guatemala, Fl. Guatemala 9:273. 1973.
19. Salvia shannonii Donn. Sm., Bot. Gaz. 19:256. 1894.
Mexico, Guatemala, Honduras, Salvador, Fl. Guatemala 9:397
1973.
20. Salvia leucochlamys Epling, Bull. Torr. Bot. Club 67:515.
1940. Guatemala, Fl. Guatemala 9:290. 1973.
21. Salvia lasiantha Bth., Lab. Gen. & Sp. 276. 1833.
Calyx after flowering 1-1.5 cm long. Larger blades 3-7(-13)
cm long. S. Mexico, Guatemala.
22. Salvia pittieri Briq., Bull. Soc. Bot. Belg. 30, part 1:237.
1891. Endemic in Costa Rica.

23. Salvia lavanduloides HBK., Nov. Gen. & Sp. 2:287. 1817.
Petioles of larger leaves 1-5 (-10) mm long. Calyx-teeth acute to short-tapered. Central & s. Mexico, Guatemala, Honduras, Fl. Guatemala 9:289. 1973.
24. Salvia gracilis Bth., Lab. Gen. & Sp. 258. 1833.
 Salvia membranacea Bth., Lab. Gen. & Sp. 259. 1833.
 Salvia irazuensis Fern., Proc. Amer. Acad. 35:540. 1900.
Pedicels 1-6 mm long. Calyx after flowering 6-8 mm long.
Mexico, Guatemala, C. R., Panama, Fl. Guatemala 9:283. 1973.
25. Salvia purpurea Cav., Icon. 2:52, t. 166. 1973.
Central & southern Mexico, Guatemala, Honduras,
 Fl. Guatemala 9:296. 1973.
- Nicaragua:
Nueva Segovia, Jalapa. Atwood, Marshall & Neill 6867 (BM, ENAG, F, FLAS, GH, MICH, MO, NY, REED, SEYM, SMU, UC).
Jinotega, Jinotega. Moore 2109 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).
Matagalpa, Matagalpa. Zelaya 975 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP, WIS).
26. Salvia polystachya Ortega, Hort. Matr. Dec. 55. 1797.
 Salvia compacta Kuntze, Rev. Gen. 530. 1891.
 Salvia cataria Briq., Ann. Conserv. Jard. Bot. Geneve 2: 142. 1898.
Petioles of larger leaves 2-4 cm long. Pedicels 0.5-2 mm long.
Mexico through Central America to Panama,
 Fl. Guatemala 9:295. 1973.
27. Salvia farinacea Bth., Lab. Gen. & Sp. 274. 1833.
Pedicels 1-2 (-3) mm long. Sw. United States, ne. Mexico, Guatemala, Salvador, Fl. Guatemala 9:282. 1973.
28. Salvia nana HBK., Nov. Gen. & Sp. Pl. 2:289. 1817.
Central & s. Mexico, Guatemala, Fl. Guatemala 9:293. 1973.
29. Salvia disjuncta Fern., Proc. Amer. Acad. 35:533. 1900.
 Veins elevated. Calyx after flowering 12-15 mm long.
 Mexico, Guatemala, Fl. Guatemala 9:281. 1973.
30. Salvia alariformis L. Wms., Fieldiana, Bot. 34:108. 1972.
Petioles of larger leaves mostly 3-5 mm long. Pedicels 3-7 mm long. Guatemala, Honduras, Fl. Guatemala 9:277. 1973.
31. Salvia maxonii Epling, Fedde Rep. Sp. Nov. Beih. 110:276.
 Largest leaves 5-7 cm wide. Pedicels 2-4 mm long.
 Guatemala. Known only from the type, Maxon 3569.
32. Salvia kellermanii Donn. Sm., Bot. Gaz. 56:60. 1913.
 Illustr., Fl. Guatemala 9:288. 1973. Petioles 1-5 cm long.
 Guatemala, Honduras, Salvador, Fl. Guatemala 9:287. 1973.

33. Salvia guarinae Standley, Ceiba 1:44. 1950. Honduras.

In the original description, this species is said to be much like Salvia kellermanii except for the latter's "quite glabrous calyx". Some of the clearest distinctions are here tabulated.

| | |
|---------------------------------|-------------------------------------|
| <u>Salvia guarinae</u> Standley | <u>Salvia kellermanii</u> Donn. Sm. |
| Calyx hispidulous on nerves | Calyx quite glabrous |
| Bracts long-persistent | Bracts caducous |
| Pedicels up to 6 mm long | Flowers sessile |

34. Salvia leptophylla Bth., Lab. Gen. & Sp. 249. 1833.
W. Texas, Mexico (FLAS), Guatemala, Fl. Guatemala 9:290. 1973.
35. Salvia costaricensis Oersted, Vid. Medd. Kjoebenhavn 1852:
39. 1853. Endemic in Costa Rica, Fl. C. R. 1027. 1938.

36. Salvia drymocharis Epling ex Standley, Field Mus. Pub.
Bot. 18:1028. 1938. Rep. Spec. Nov. Beih. 110:258.
1939. Costa Rica.

37. Salvia tiliaefolia Vahl, Symb. Bot. 3:7. 1794.

a. Calyx in flower 4-5.5 mm long, glabrous or nearly so . . .
. var. albiflora (Mart. & Gal.) L. Wms.

a. Calyx in flower 7-8 mm long b.

b. Calyx glabrous or nearly so
. var. alvajaca (Oersted) L. Wms.

b. Calyx hispidulous on nerves only var. tiliaefolia

Salvia tiliaefolia Vahl var. tiliaefolia. Petioles 1-5 cm long.

Pedicels 1-3 mm long. Mexico to Panama, n. S. A.

Nicaragua:

Esteli, Cerro Santa Rosa. Seymour 7630 (MO, SEYM, UCA).

Salvia tiliaefolia Vahl var. albiflora (Mart. & Gal.) L. Wms.,
Fieldiana, Bot. 34:113. 1972. Mexico, Guatemala, Honduras,
Panama, Fl. Guatemala 9:299. 1973.

Salvia tiliaefolia Vahl var. alvajaca (Oersted) L. Wms., Fieldiana,
Bot. 34:113. 1972.

Salvia alvajaca Oersted, Dansk. Vid. Medd. 1853:38, f. 2. 1853.

Salvia ourophylla Briq., Ann. Conserv. Jard. Geneve 2:126. 1898.

Salvia permixta Briq., Ann. Conserv. Jard. Geneve 2:129. 1898.

Illustr., Fl. Panama 56:79. 1969. Guatemala, Costa Rica.

Nicaragua: Matagalpa, Tuma. Atwood 3970 (BM, ENAG,

FLAS, GH, MO, NY, SEYM, SMU).

38. Salvia longimarginata Briq., Ann. Conserv. Jard. Bot. Geneve 2:127. 1898.

Central America, Colombia, Venezuela, Fl. Panama 56:78. 1969.

39. Salvia pteroura Briq., Ann. Conserv. Jard. Bot. Geneve 2:
139. 1898. Costa Rica, Panama, Fl. Panama 56:76. 1969.

40. Salvia microphylla HBK., Nov. Gen. & Sp. 2:294. 1817.

Non Salvia microphylla Sesse & Moc. 1893.

Leaves with tiny resin globules above and beneath, beneath slightly scabrous, otherwise glabrous. Petioles 7-27 mm long. Mexico (FLAS), Guatemala.

41. Salvia pansamalensis Donn. Sm., Bot. Gaz. 23:249. 1897.
Guatemala. Leaves glabrous except sparsely hairy on
veins beneath.
42. Salvia bella Briq., Ann. Conserv. Jard. Bot. Geneve 2:169.
1898. Costa Rica.
43. Salvia trichopes Epling, Bull. Torrey Bot. Club 68:564. 1941.
Known only from type collection, Panama, Chiriqui,
Woodson & Schery 693 (Isotype MO).
44. Salvia recurva Bth. in DC. Prodr. 12:336. 1848.
Blades covered above with short harsh, not erect hairs
with swollen bases. Longer petioles 6-12 cm long. Pedi-
cels 4-13 mm long. S. Mexico, Guatemala.
45. Salvia subrubens Epling, Fedde Rep. Sp. Nov. Beih. 110:
335. 1939. Guatemala.
46. Salvia phaenostemma Donn. Sm., Bot. Gaz. 23:13. 1897.
Guatemala.
47. Salvia cacaliaefolia Bth. in DC. Prodr. 12:348. 1848.
Mexico, Guatemala, Honduras, Fl. Guatemala 9:278. 1973.
48. Salvia sparsiflora Epling, Bull. Torrey Bot. Club 71:494.
1944. Guatemala. Known only from type, Steyermark 51740.
49. Salvia fratrum Standley, Fieldiana, Bot. 18:1028. 1938.
Costa Rica.
50. Salvia flaccida Fern., Proc. Amer. Acad. 35:509. 1900.
Pedicels 2-5 mm long.
Mexico, Guatemala, Fl. Guatemala 9:282. 1973.
51. Salvia urica Epling, Fedde Rep. Sp. Nov. Beih. 10:175.
1939. Pedicels 2-5(-8) mm long. Mexico, British Hon-
duras, Guatemala, Honduras, Fl. Guatemala 9:300. 1973.
52. Salvia dorisiana Standley, Ceiba 1:43. 1950. Honduras.
53. Salvia coccinea Juss. ex Murray, Comm. Goett. 1:86, t. 1.
1788. Larger blades 2.5-4(-5) cm wide. Pedicels 3-5
mm long. S. United States, Florida (FLAS), Mexico,
British Honduras, Guatemala, Salvador, W. I., S. A.,
Fl. Guatemala 9:280. 1973.
54. Salvia iodochroa Briq., Ann. Conserv. Jard. Bot. Geneve
2:161. 1898. Endemic in Costa Rica, Fl. C. R. 18:
1029. 1938.
55. Salvia areolata Epling, Bull. Torrey Bot. Club 71:493. 1944.
Blades rounded or widely cuneate at base. Longest petioles
1.5-1.7 cm long.
Endemic in Guatemala, Fl. Guatemala 9:278. 1973.

10. LEPECHINIA Willdenow

Herbs, usually in Central America, sometimes shrubs.
Leaves crenate or dentate, lower ones on long petioles, upper
ones sessile. Flower-clusters in terminal, often interrupted

spikes. Calyx often slightly 2-lipped, the 5 teeth almost equal. Corolla 2-lipped, lips almost equal. Stamens 4; anther-cells divergent or parallel. Nutlets ovate, smooth, black.

In Lepechinia, the lower lip of the corolla is plane; in Hyptis and Marsypianthes, the lower lip is saccate. In Lepechinia, the stamens and style are included in the corolla, whereas in Stachys they are exerted.

- A. Stems with fine or short hairs, some hairs branched; spikes very dense; corolla about equal to calyx 3. Lepechinia caulescens (Ortega) Epling
- A. Stems with longer spreading hairs B.
- B. Stems hirsute-villous; blades 8 cm long, 4 cm wide, obtuse at tip, truncate at base; pedicels 2 mm long; clusters distant 2. Lepechinia alpina (Oersted) Standley
- B. Stems with long spreading white hairs; flowers on short pedicels; clusters distant; corolla shorter than calyx 1. Lepechinia schiedeana (Schlecht.) Vatke
1. Lepechinia schiedeana (Schlecht.) Vatke, Verh. Bot. Ver. Brandenb. 36. 1875. Illustr., Fl. Panama 56:109. 1969 Fl. Guatemala 9:263. 1973. Central America.
2. Lepechinia alpina (Oersted) Standley, Fieldiana, Bot. 18: 1023. 1938.. Costa Rica.
3. Lepechinia caulescens (Ortega) Epling, Repert. Sp. Nov. Beih. 85:20. 1935. Central & s. Mexico, Guatemala, Fl. Guatemala 9:262. 1973.

11. HEDEOMA Persoon

Herbs. Leaves entire or dentate. Flowers in clusters in axils of leaves, on pedicels (in ours) or in terminal racemes. Calyx 13-nerved, 5-toothed, teeth filiform, almost equal, or lower teeth longer than upper, hairy in throat. Corolla 2-lipped, one lip erect, the other spreading. Stamens 2. Nutlets ovoid, smooth.

1. Hedeoma costatum Hemsley, Biol. Cent. Amer. Bot. 2:547. 1882. Illustr., Fl. Guatemala 9:247. 1973.

Stem slender, densely hairy. Leaves 7-20 mm long, ovate, acute or obtuse, obtuse or rounded at base. Calyx hispidulous. Corolla purple, 16-18 mm long.

Mexico; coll. once in Guatemala., Fl. Guatemala 9:246. 1973.

12. SATUREJA Linnaeus

Herbs or shrubs. Leaves dentate or entire. Flowers (in Central America) solitary on pedicels in axils of leaves. Calyx 10-15-nerved, slightly 2-lipped, 3 upper teeth joined, throat glabrous or pilose. Corolla 2-lipped, upper lip erect, the lower spreading, 3-lobed. Stamens 4, in pairs, glabrous, anther-cells divergent. Nutlets oblong or ovate, smooth.

A. Calyx 3.5-4 mm long; throat not hairy; corolla-tube 3.5 mm long; herb, up to 20 cm tall; blades 5-12 mm long; stems glabrous or nearly so . . . 1. Satureja brownei (Sw.) Briq.

A. Calyx 7 mm long; throat densely hairy; corolla 3 cm long; shrub up to 2 m tall; blades 1.5-3.5 cm long; young stems puberulent with recurved hairs 2. Satureja seleriana Loesener

1. Satureja brownei (Sw.) Briq. in Engler & Prantl, Pflanzenfam. IV, 3a:300. 1897.

Micromeria brownei (Sw.) Bth., Labiat. 372. 1834.

S. United States, Florida, Mexico, Honduras, Costa Rica, W. I., nw. S. A., Fl. Guatemala 9:301. 1973.

2. Satureja seleriana Loesener, Verh. Bot. Ver. Brandenb. 51: 35. 1909. Illustr., Fl. Guatemala 9:303. 1973.

Mexico, Guatemala.

13. CHAUNOSTOMA Donnell Smith

Shrubs. Hairs branched. Leaves crenate. Petioles short. Flowers in axillary racemes; racemes shorter than leaves. Calyx 5-lobed; lobes almost equal. Corolla 2-lipped. Stamens 4, much exerted. Nutlets oval, smooth.

1. Chaunostoma mecisandrum Donn. Sm., Bot. Gaz. 20:9, t. 3. 1895. Illustr., Fl. Guatemala 9:242. 1973. The only species. Stellate-tomentose. Leaves 9-15 cm long, 2-5 cm wide, with yellow glands above and beneath. Calyx blue, 8 mm long. Nutlets 2 mm long. Mexico, Guatemala, Fl. Guatemala 9:241. 1973.

14. THYMUS Linnaeus

Thyme

Herbs or dwarf shrubs. Leaves small, entire. Flowers dense, terminal or axillary. Calyx 13-nerved, hairy in throat, 2-lipped, upper lip 3-toothed, the lower 2-cleft. Corolla 2-lipped, upper lip notched at tip, the lower 3-cleft. Stamens 4, anther-cells parallel or divergent. Nutlets ovoid or oblong, smooth.

1. Thymus vulgaris L., Sp. Pl. 591. 1753.

Calyx 3-5 mm long, hirtellous. Corolla lilac or pink, 4-6 mm long. Europe, Florida (cult.) (FLAS), Guatemala.

15. CUNILA Linnaeus

Herbs or shrubs. Leaves small. Flowers axillary or terminal, in cymes or spikes or heads. Calyx equally 5-toothed, 10-13-nerved. Corolla 2-lipped, white or purplish. Perfect stamens 2. Nutlets ovoid or oblong, smooth.

1. Cunila polyantha Bth., Labiatae 362. 1834.

Illustr., Fl. Panama 56:82. 1969; Fl. Guatemala 9:245.

1973. Shrub, arching or climbing. Branches hairy. Petiole short. Blades 2-5 cm long, acute or acuminate, rounded at base, glandular-dotted. Flowers in clusters. Pedicels long. Calyx 3 mm long, slightly hairy; teeth acuminate. Corolla 4 mm long, white.

S. Mexico, Guatemala, Honduras, Costa Rica, Panama, Fl. Panama 56:83. 1969.

16. MENTHA Linnaeus

Herbs. Leaves toothed. Petioles commonly short. Flowers in axils of leaves or in dense terminal spikes. Calyx cup-shaped or tubular, 10-nerved, 5 lobes equal or nearly so. Corolla almost equally 4-toothed. Stamens 4. Nutlets ovoid, smooth.

1. Mentha citrata Ehrh., Beitr. 7:150. 1792.

Europe, Guatemala.

17. HYPTIS Jacquin

Herbs or shrubs. Flowers in axils of leaves in heads or in spikes or panicles. Calyx-teeth 5, about equal, acute to subulate, often hairy. Corolla-lobes 5, nearly equal. Stamens 4. Nutlets ovoid or oblong, smooth or roughened.

Distinguished from Stachys by the corolla-lobes being nearly equal and the middle lobe of lower lip being dipper-shaped (saccate). Hyptis and Marsypianthes differ from Stachys in the stamens being declined toward the lower lip of the corolla.

Combined key to Hyptis, Marsypianthes, Lepechinia and Stachys, as the generic differences are largely in flowers, --characters not present in fruit.

- A. Flowers not in dense globose heads, in clusters (verticils), 3-12-flowered, often not on peduncles, sometimes sessile in axils of leaves B.
- B. Calyx-teeth widely spreading in fruit; flowers sessile in clusters in long slender spikes, leafy-bracted or not C.
- C. Calyx-teeth 2.5-3.5 mm long, subulate (awl-like), spinose; blades 3-8 cm long, densely hairy above and beneath; corolla-tube 3 mm long; shrub, erect or arching, p. 33. 2. Hyptis mocinniana Bth.
- C. Calyx-teeth 3.5-4.5 mm long, deltoid-lanceolate, pilose or glabrous; blades 5-13 cm long, hairy above, below hairy on veins only; corolla-tube 18-23 mm long; usually a vine, p. 29 Stachys lindenii Bth.
- B. Calyx-teeth erect or slightly spreading or connivent in fruit D.
- D. Calyx in fruit 1-2.5 mm long; bracts persistent; calyx-teeth erect or connivent in fruit; blades 2-8 cm long E.
- E. Calyx with conspicuous tuft of white hairs in throat, teeth filiform-subulate; bracts linear; blades cuneate to subcordate at base, densely hairy beneath; corolla-tube 1.5 mm long, p. 34. 4. Hyptis pectinata (L.) Poiteau
- E. Calyx without conspicuous tuft of white hairs in throat, teeth triangular, obtuse; bracts setaceous; blades acute to attenuate at base, almost glabrous; corolla 3 mm long, p. 33 l. Hyptis verticillata Jacq.
- D. Calyx in fruit (3-)4-12 mm long including teeth; peduncles 0-2 cm long F.
- F. Calyx-teeth deltoid to lanceolate, widened toward base, spine-tipped, 0.5-4.5 mm long; calyx hairy to glabrous G.
- G. Calyx reticulate-veined, 12 mm long in fruit; bracts usually ovate; flowers in terminal, usually interrupted spikes, p. 25. Lepechinia
- G. Calyx not reticulate-veined, 3-8 mm long in fruit H.
- H. Plant a climbing shrub; calyx-tube 4 mm long, teeth 0.5 mm long, p. 35 6. Hyptis scandens Epling
- H. Plant an herb I.
- I. Nutlets hemispheric, with fringed margins; calyx 6-8 mm long, densely hairy, teeth 2.5 mm long; stems prostrate, forming mats; corolla about equaling calyx, p. 39 Marsypianthes chamaedrys (Vahl) Kuntze

- I. Nutlets obovate, not fringed; calyx-tube 3-7 mm long, pilose to glabrous, teeth (1-)2-4.5 mm Long; stems erect to prostrate, p. 8. . . Stachys
- F. Calyx-teeth setaceous or subulate, scarcely widened at base, nerves hairy; calyx 4-7 mm long in fruit, teeth 1-2 mm long J.
- J. Blades almost glabrous above and beneath; calyx-teeth 2 mm long; flowers ascending in dense uninterrupted spikes; corolla-tube 4 mm long, p. 35 7. Hyptis americana (L.) Poiteau
- J. Blades hairy above and beneath or rarely glabrate K.
- K. Calyx in fruit 7-9 mm long, teeth 2 mm long; bracts spreading, shorter than calyx, not concealing it; corolla-tube 4-6 mm long; herb, p. 33 3. Hyptis suaveolens (L.) Poiteau
- K. Calyx in fruit 2-4 mm long, teeth 1-1.5 mm long; corolla-tube 3-4 mm long L.
- L. Bracts conspicuous, ovate or elliptic, appressed, longer than calyx, often concealing it; herb, p. 35 5. Hyptis mutabilis (A. Rich.) Briq.
- L. Bracts inconspicuous, filiform or linear, sometimes hidden under wooly hairs; calyx wooly; tree, p. 36 13. Hyptis arborescens Epling
- A. Flowers in dense, many-flowered heads, often globose when mature, usually on peduncles M.
- M. Calyx-tube glabrous or nearly so outside, in Hyptis atorubens, pilose at base and teeth only; heads 1-2.5 cm thick P.
- N. Blades abundantly hairy above and beneath; peduncles 0.5-4 cm long; calyx 2-5 mm long; corolla-tube 5-6 mm long O.
- O. Calyx-tube recurved in age, teeth 1-1.2 mm long; blades 3-9 cm long; heads 1-1.5 cm thick; peduncles 2-4 cm long; bracts hidden, p. 35 10. Hyptis recurvata Poiteau
- O. Calyx-tube not recurved, teeth 1-2.5 mm long; blades truncate or rounded at base; bracts 7-12 mm long P.
- P. Largest blades 6-8 cm long, on petioles, ovate; calyx-tube in fruit 4-7 mm long; heads 2 cm thick; bracts 10-12 mm long, p. 36 12. Hyptis sinuata Bth.

- P. Largest blades up to 5 cm long, sessile, oblong-lanceolate; calyx-tube in fruit 2.5-3 mm long; heads 1-1.5 cm thick; bracts 7-10 mm long; inflorescence conspicuously white-hairy, p. 36 14. Hyptis dilatata Bth.
- N. Blades almost glabrous or puberulent or sparsely villous beneath on veins; peduncles 0.5-7 cm long; calyx-tube almost glabrous or minutely hairy; bracts 4-8 mm long Q.
- Q. Calyx-tube 8-10 mm long in fruit; heads axillary, 2-2.5 cm thick; peduncles 2-7 cm long; blades slightly hairy or glabrous, 4-12 cm long; corolla-tube 4-5 mm long, p. 37 23. Hyptis capitata Jacq.
- Q. Calyx-tube 3.5-4.5 mm long in fruit; heads 0.8-1.6 cm thick; peduncles 0.5-3 cm long; corolla-tube 2.5-3 mm long; bracts 4-8 mm long R.
- R. Blades glabrous above, hirsute or glabrous beneath, cuneate-attenuate at base, 6-12 cm long; calyx-tube almost glabrous, p. 37 20. Hyptis lanceolata Poiret
- R. Blades with sparse long hairs above and beneath, rounded at base, 1.5-4 cm long; calyx-tube hairy at base, p. 37 22. Hyptis atrorubens Poiteau
- M. Calyx-tube distinctly or abundantly hairy outside, not only at base; blades hairy beneath, not only on veins S.
- S. Inflorescence conspicuously white with hairs or tomentose; calyx 2.5 mm long in fruit, teeth 1.5 mm long; peduncles short; blades densely tomentose beneath, up to 8 cm long, 4 cm wide; bracts hidden under wool; shrub, p. 36 11. Hyptis oblongifolia Bth.
- S. Inflorescence not conspicuously white with hairs; herb T.
- T. Calyx-teeth triangular or lanceolate; heads axillary; peduncles surpassed by leaves, 0-1 cm long; blades hairy above and beneath, sessile or on short petioles; bracts 3-4 mm long U.
- U. Bracts filiform V.
- V. Calyx 2-3 mm long, teeth 1 mm long, lanceolate; stem with appressed hairs; blades 3-8 cm long; corolla-tube 1-1.5 mm long, p. 15 8. Hyptis pulegioides HBK.
- V. Calyx 5-6 mm long, teeth linear-attenuate; stem when young scabrous; hairs stellate; blades 1-3 cm long; corolla pale-purple, about 1 cm long, p. 35 9. Hyptis asperifolia Standley

- U. Bracts ovate-lanceolate; calyx-teeth deltoid; blades 5-10 cm long; corolla-tube 2-3 mm long; peduncles 0-1 cm long
- W. Calyx-teeth 0.7-1 mm long, tube about 1.5 mm long; blades acute at each end, resin-dotted, p. 36 17. Hyptis obtusiflora Presl
- W. Calyx-teeth 1.5-2 mm long, tube in fruit 3 mm long; blades acute or obtuse at tip, truncate or acuminate at base, p. 36 18. Hyptis intermedia Epling
- T. Calyx-teeth setaceous to subulate X.
- X. Blades attenuate to base or decurrent on petioles Y.
- Y. Calyx-teeth 1.5-2.5 mm long; peduncles 0.3-1.5 cm long; blades 4-6 cm long; corolla-tube 2.5-3 mm long, p. 36 19. Hyptis brevipes Poiteau
- Y. Calyx-teeth 3-3.5 mm long; peduncles 2.5-5 cm long; blades 7-18 cm long, 0.5-4 cm wide Z.
- Z. Heads hemispherical; bracts hairy; corolla-tube 4.5-5 mm long, p. 38 . . . 25. Hyptis conferta Bth.
- Z. Heads spherical; bracts glabrous; corolla-tube 6-7 mm long, p. 38 . . . 26. Hyptis savannarum Briq.
- X. Blades cuneate or rounded or truncate or cordate at base Aa.
- Aa. Blades sparsely hirsute, sessile; peduncles 3-5 cm long; calyx at least 4 mm long; corolla-tube 4-4.5 mm long, p. 38 24. Hyptis vilis Kunth & Bouche
- Aa. Blades not hirsute; calyx-teeth 1-3.5 mm long Ab.
- Ab. Blades 1.5-3 cm long, scabrous or strigose above, beneath strigose or sericeous or almost glabrous, sessile or petioles 5 mm long; stem appressed pilose or glabrate; calyx-tube in fruit 4-5 mm long, p. 36 15. Hyptis lantanaefolia Poiteau
- Ab. Blades 3-8.5 cm long, hairy above and beneath, not scabrous, not strigose, not sericeous Ac.
- Ac. Stem densely puberulent, hairs mostly recurved; calyx at least 2.5-3 mm long, teeth 1-2.5 mm long; petioles of larger leaves 0.5-3(-3.5) cm long; corolla-tube 3.5-4 mm long, p. 36 16. Hyptis urticoides HBK.
- Ac. Stem densely soft-hairy; calyx at least 5-6 mm long, teeth 2.5-3 mm long; petioles 0.5-1 cm long; corolla-tube 5-6 mm long, p. 37 21. Hyptis brachiata Briq.

1. Hyptis verticillata Jacq., Icon. Pl. Rar. 1:101, t. 113. 1787.
Mexico (GH), British Honduras to Salvador and Panama,
W. I., S. A.

Nicaragua:

Zelaya, Comarca del Cabo, Waspan. Atwood 3561 (BM,
ENAG, GH, SEYM, SMU).

Punta del Mico. Atwood 4244 (SEYM, SMU).

Nueva Segovia, Jalapa. Seymour 5517 (ENAG, SEYM).

Chinandega, Aserradores Is. Baker 93, 2126 (GH).

Chinandega. Baker 103, 2151 (GH).

Managua, Managua. Grant 1068 (GH).

Granada, Volcan Mombacho. Nichols 2007 (BM, ENAG, F,
SEYM, SMU); Nelson 7596 (FLAS, GH, MO, SEYM,
SMU, UCA).

Carazo, Santa Teresa. Hamblett 1293 (BM, ENAG, F, GH,
SMU); Moore 1301 (ENAG, MO, NY,
SEYM, UC, WDP).

Rivas, La Virgen. Seymour 1241 (VT).

2. Hyptis mocinniana Bth., Labiat. Gen. & Sp. 129. 1834.
Illustr., Fl. Guatemala 9:253. 1973.

Similar to Hyptis stellulata Bth. Calyx-lobes spreading in
both species, larger and more densely hairy in H. mocinniana.
Leaves hairy beneath in H. mocinniana; in H. stellulata, leaves
glabrous.

Mexico to Costa Rica.

Nicaragua:

Madriz, Yalaguina. Nichols 948 (BM, SEYM).

Chontales, Cuapa. Marshall & Neill 6671 (BM, ENAG, F,
FLAS, GH, MICH, MO, NY, SEYM, SMU,
UC).

Leon, La Paz. Baker 210 (GH).

Managua, Managua. Dudgey, Hamblett & Nichols 166 (B, BM,
ENAG, F, FLAS, GH, MICH, MO, MSC,
NY, SEYM, SMU, UC, US, WDP, WIS,
YU).

Granada, Volcan Mombacho. Atwood A185 (MSC).

Carazo, Santa Teresa. Moore 1298 (SEYM, SMU).

Rivas, San Juan del Sur. Narvaez 1254 (ENAG, F, GH, MO,
NY, SEYM, SMU, UC, WDP).

3. Hyptis suaveolens (L.) Poiteau, Ann. Mus. Hist. Nat. Paris
7:472, t. 29, f. 2. 1806.

Mexico (GH), British Honduras to Panama, W. I., S. A.,
Old World, Fl. Guatemala 9:257. 1973.

Nicaragua:

Zelaya, Between El Centro and La Cruz. Molina 2445 (GH).

- Zelaya, Siuna. Seymour 5022 (SEYM).
 Nueva Segovia, Dipilto. Marshall 6358 (BM, ENAG, FLAS,
 GH, MO, NY, SEYM, SMU, UC).
 Jalapa. Seymour 5523 (VT).
 Ocotal. Moore 813 (SEYM, SMU, WDP).
 Boaco, Teustepe. Seymour 2456 (BM, SEYM).
 Chontales, Acoyapa. Nichols 1740 (ENAG, F, GH, SEYM).
 Marshall & Neill 6531 (BM, ENAG,
 FLAS, MO, NY, SMU, UC).
 Apompua. Seymour 2694 (VT).
 Dreñeje de Lago Granada. Shank & Molina 4591
 (GH).
 Juigalpa. Dudgey 1604 (NY, UC); Seymour 1647 (VT).
 Chinandega. Chinandega. Baker 129, 2024 (GH).
 Leon, Las Lomas-El Diamante. Astacio (ENAG).
 Managua, Hills behind Managua. Grant 741 (GH).
 Masaya, Lake Masaya. Hamblett 88 (ENAG, SEYM, WDP).
 Granada, Granada. Grant 924 (GH).
 Rivas, La Virgen. Seymour 1240 (VT).
 Without definite locality. Garnier A1377 (GH).
 4. Hyptis pectinata (L.) Poiteau, Ann. Mus. Hist. Nat. Paris 7:
 474, t. 30. 1806. Probable synonym: *Hyptis nicaragu-*
ensis Ortega in Lab. Centroamericanae pp. 32-42 in Vid-
 enskabelige Meddelelser. 1853. Specimen cited coll. in
 region of Granada.
 Mexico, British Honduras to Salvador and Panama, W. I.,
 S. A.
 Nicaragua:
 Zelaya, Madregara. Narvaez 3244 (BM, ENAG, F, GH, MICH,
 MO, NY, SEYM, SMU, UC, WDP, WIS);
 Nelson 5054 (VT); Seymour 5083 (SEYM).
 Nueva Segovia, Jicaró. Seymour 6446 (SEYM).
 Ocotal. Nichols 831 (SMU); Seymour 863 (VT).
 Matagalpa, Tuma. Atwood 3969 (VT).
 Boaco, Camoapa. Seymour 3488 (SEYM).
 Chontales, Apompua. Seymour 2697 (SEYM).
 Juigalpa. Nichols 1642 (VT).
 Santo Domingo. Seymour 3411 (SEYM).
 Rio San Juan, San Carlos. Atwood 2041 (BM, ENAG, NY,
 SEYM, SMU, UC, WDP).
 Managua, Masachapa. Nichols 1375 (VT).
 Managua?, Sierra de Managua. Grant 945, 1082 (GH).
 Carazo, Casa Colorada. Seymour 566 (MO, SEYM).
 Santa Teresa. Dudgey 1288 (VT); Hamblett 1293a (B,
 FLAS, MSC, YU).
 Rivas, Amayo. Astacio (ENAG).

5. Hyptis mutabilis (L. Rich.) Briquet, Bull. Herb. Boiss. 4: 788. 1896.
Mexico, Honduras and Salvador to Panama, S. A.
Nicaragua:
Nueva Segovia, Ocotal. Nichols 826 (VT).
Matagalpa, Jicaró. Seymour 6447 (SEYM).
Boaco, Boaco. Seymour 1491 (SEYM, SMU).
Camoapa. Seymour 3489 (F, MO), 3536 (BM, GH, SEYM).
Chontales, Cuapa. Marshall & Neill 6672 (BM, ENAG, FLAS, GH, MO, NY, SEYM, SMU, UC).
Santo Tomas. Seymour 2770 (ENAG, F, GH, MO, NY, SEYM, UC, WDP).
Chinandega, Chinandega. Baker 124 (GH).
Department uncertain, Volcan El Viejo. Baker 2174 (GH).
Masaya, Masaya. Baker 102 (GH).
Rivas, Ometepe. Smith s. n. (GH).
6. Hyptis scandens Epling, Carnegie Inst. Wash. Publ. 522:239. 1940. Guatemala. Known from the type, only, Lundell 4421.
7. Hyptis americana (Aublet) Urban, Fedde Repert. Sp. Nov. 15: 322. 1918. Hyptis spicigera Lam., Encycl. 3:185. 1789.
Inflorescence dense, terminal, cylindrical, not interrupted.
Mexico, British Honduras, Guatemala, Honduras, Canal Zone, W. I., S. A., Old World including Africa, Fl. Guatemala 9:248-9. 1973.
Nicaragua:
Chontales, Acoyapa. Hamblett 1695 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).
Marshall & Neill 7080 (ENAG, FLAS).
8. Hyptis pulegioides Pohl ex Bth., Labiat. Gen. & Sp. 128. 1833. Throughout Central America, n. S. A., Fl. Panama 56:87. 1969.
9. Hyptis asperifolia Standley, Journ. Arnold Arb. 11:40. 1930. Honduras, Dept. Comayagua, near Siguatepeque, Standley 56231 (F), type.
10. Hyptis recurvata Poiteau, Ann. Mus. Hist. Nat. Paris 7: 467, t. 28, f. 1. 1806. Illustr., Fl. Panama 56:89. 1969.
S. Mexico, British Honduras, Nicaragua to Panama, S. A.
Nicaragua:
Zelaya, Bluefields. Nelson 4122 (GH, MO, SEYM).
Madregara. Seymour 3104 (NY, SEYM), 3277 (SEYM).
Chontales, Santo Domingo. Atwood 3348 (SEYM, SMU);
Seymour 3408 (BM), 3410 (GH).
Rio San Juan, San Bartolo. Robbins 6177 (BM, ENAG, F, FLAS, GH, MO, NY, SEYM, SMU, UC).
San Carlos. Atwood 2040 (ENAG, F, GH, MO,

SEYM).

11. Hyptis oblongifolia Bth. in DC. Prodr. 12:125. 1848.

S. Mexico, Honduras, Nicaragua, Costa Rica, Panama, Fl. Guatemala 9:255. 1973.

Nicaragua:

Department uncertain, Volcan El Viejo, Fl. C. R. 1019. 1938.

12. Hyptis sinuata Pohl ex Bth. in Labiat. Gen. & Sp. 103. 1833.

Nicaragua, Fl. Guatemala 9:256. 1973.

13. Hyptis arborescens Epling, Rep. Sp. Nov. 32:100. 1933.

Calyx wooly. Nicaragua:

Department uncertain, Volcan El Viejo. Baker 18 (GH).

14. Hypstis dilatata Bth. in DC. Prodr. 12:103, f. 6. 1848.

Illustr., Fl. Panama 56:90. 1969. Panama.

15. Hyptis lantanaefolia Poiteau, Ann. Mus. Hist. Nat. Paris 7: 468, t.29, f.1. 1806. Peduncles 1.5-2.5(-7) cm long.

S. Mexico, British Honduras, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, W. I., S. A., Fl. Guatemala 9:252. 1973.

Nicaragua:

Zelaya, Comarca del Cabo, Bilwaskarma. Seymour & Nelson 4715 (GH, MO, SEYM).

Waspan. Atwood 3639 (FLAS, US, USF, WIS);

Seymour 3697 (BM, DUKE, ENAG, F. GH, MO, NY, SEYM, SMU, UC, WDP, YU).

Madregara. Atwood 3237 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, REED).

Seymour 3279 (B, ENAG, MSC, REED).

Puerto Cabezas. Nelson 4535 (ENAG, F, MO, SEYM).

Matagalpa, Tuma. Seymour 4051 (VT).

Chontales, Santo Tomas. Seymour 2794 (VT).

16. Hyptis urticoides HBK., Nov. Gen. & Sp. 2:320. 1817.

Petioles of larger leaves 0.5-3(-3.5) cm long. Peduncles 0.3-3 cm long. Mexico to Panama.

Nicaragua: Managua, Managua. Garnier A1376 (GH).

17. Hyptis obtusiflora Bth., Labiat. Gen. & Sp. 107, f. 7. 1833.

Illustr., Fl. Panama 56:92. 1969. Panama.

Calyx about 1.5 mm long

Zelaya, Madregara. Seymour 3278 (ENAG, F, GH, MO, SEYM).

Chontales, Santo Domingo. Seymour 3409 (BM, SEYM, SMU).

18. Hyptis intermedia Epling, Bull. Torrey Bot. Club 67:510.

1840. Guatemala. Calyx-tube in fruit 3 mm long.

19. Hyptis brevipes Poiteau, Ann. Mus. Hist. Nat. Paris 7:465.

1906. Heads on peduncles. Mexico to Panama, W. I., S. A.

Nicaragua:

Zelaya, Comarca del Cabo, Waspan. Nelson 4864 (ENAG, VT).

Limbaika. Seymour 4939 (BM, ENAG, F, GH, MO, NY, SEYM; SMU, UC).

Puerto Cabezas

NY, SEYM, SMU, UC).

Puerto Cabezas. Atwood 4451 (VT).

20. Hyptis lanceolata Poirét, Encycl. Suppl. 3:114. 1813.

Guatemala?, W. I., S. A., tropical Africa. "It is closely related to H. brevipes and may not be distinct from that species." Fl. Guatemala 9:252. 1973. We have seen no specimen of this species.

21. Hyptis brachiata Briquet, Ann. Conserv. Jard. Bot. Geneve 2:215. 1898.

Costa Rica, Panama, Colombia, Venezuela, Fl. Panama 56-93. 1969.

Nicaragua: Chontales, Santo Tomas. Seymour 2795 (NY, SEYM, UC).

22. Hyptis atrorubens Poiteau, Ann. Mus. Hist. Nat. Paris 7: 466, t. 27, f. 3. 1806. Illustr., Fl. Panama 56:94, f. 8. 1969. Heads terminal and axillary.

S. Mexico, British Honduras, Guatemala, Honduras, W. I., S. A., Fl. Guatemala 9:249. 1973.

Nicaragua:

Zelaya, Comarca del Cabo, Bilwaskarma. Seymour 4662 (VT).
Waspan. Seymour 3589 (BM, F, GH, MO, SEYM, SMU).

23. Hyptis capitata Jacquin, Coll. Bot. 1:102. 1787.

Heads 2-2.5 cm thick. Peduncles 1-4 cm long.

S. Mexico to Panama, W. I., S. A., Old World tropics, Fl. Guatemala 9:250. 1973.

Nicaragua:

Zelaya, El Bluff. Hamblett 621 (BM, ENAG, F, GH, MO, SEYM, SMU); Seymour 713 (NY, UC).

El Recreo. Hamblett 454 (VT).

Madregara. Atwood 3238 (SEYM, SMU).

Rama. Nichols 307 (VT).

Nueva Segovia. Jalapa. Robbins 5498 (VT).

Jinotega, Jinotega. Moore 2110 (VT).

La Bastilla. Zelaya 2146 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP, WIS).

Boaco, Boaco. Dudgey 1439 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC); Moore 1460 (WIS); Nichols 1475 (F, GH, MO, SEYM); Seymour 3865 (VT).

Camoapa. Atwood 3517 (VT).

Teustepe. Atwood 2422 (VT).

Chontales, Acoyapa. Dudgey 1671 (NY, SEYM).

Apompua. Atwood 2684 (BM, ENAG, F, GH, MICH, MO, NY, SEYM, SMU, UC, WDP, WIS);
Seymour 2693 (WIS).

Juigalpa. Hamblett 1616 (ENAG, MO, NY, UC,

- WDP); Moore 1629 (BM, ENAG, F, GH, SEYM, SMU); Nichols 1641 (VT).
 Rio San Juan, Castillo. Atwood 5182 (VT).
 Chinandega, Aserradores Is. Baker 104, 2127 (GH).
 El Viejo. Narvaez 2651 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).
 Masaya, Lake Masaya. Nichols 141 (SEYM).
 Granada, Mombacho. Grant 772 (GH).
 Rivas, Amayo. Astacio (ENAG).
 La Virgen. Zelaya 1244 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).
 Penas Blancas. Atwood 1814 (VT); Moore 1832 (BM, ENAG, GH, SEYM, SMU).
 24. Hyptis vilis Kunth & Bouche, Ind. Sem. Hort. Berol. 13. 1848.
 Nicaragua, Costa Rica, Venezuela, Fl. C. R. 1022. 1938.
 25. Hyptis conferta Pohl ex Bth., Labiat. Gen. & Sp. 112. 1833.
Hyptis conferta Pohl ex Bth. var. angustifolia Bth. in DC. Prodr. 12:112. 1848.
 Narrow-leaved plants have been identified as var. angustifolia but there are so many intermediates that it is difficult to draw a line between it and var. conferta.
 British Honduras, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, S. A.
 Nicaragua:
 Zelaya, Comarca del Cabo, Bihmona. Seymour 5740 (ENAG, MO, SEYM).
 Bilwaskarma. Nelson 4640 (GH, MO, SEYM), 4768 (SEYM, SMU); Seymour 4714 (BM, ENAG).
 Macantaca Creek. Allen 6495 (GH).
 Waspan. Atwood 3641 (VT), 3642 (SEYM, SMU); Seymour 3696 (MO, SEYM).
 Limbaika. Nelson 4912 (VT).
 Puerto Cabezas. Atwood 4450 (GH, MO, SEYM).
 Tamla. Seymour 6025 (VT).
 Chontales, Acoyapa. Narvaez 1718 (BM, ENAG, F, GH, MO, NY, SEYM, SMU, UC, WDP).
 26. Hyptis savanarum Briquet, Ann. Conserv. Jard. Bot. Geneve 2:216. 1898. In Fl. Guatemala, this species is treated as a synonym of Hyptis conferta; but in Fl. Panama it is treated as a distinct species. Salvador to Panama, Fl. C. R. 1020. 1938.

EXCLUDED SPECIES:

Hyptis sidaefolia (L'Heritier) Briquet, Ann. Conserv. Jard. Bot. Geneve 2:204. 1898. Reported in Fl. C. R. 1020. 1938 from Guatemala to Venezuela and Peru, but as probably not in Costa Rica. Fl. Guatemala 9:258. 1973 states that it is a South American species and that specimens from Central America so identified are probably Hyptis urticoides HBK. which closely resembles it.

18. MARSYPIANTHES Martius

Herbs. Leaves small, dentate. Flowers in axillary clusters on peduncles. Calyx 5-toothed, teeth equal, 10-nerved. Corolla 2-lipped, tube straight, upper lip 2-lobed, lower 3-lobed. Stamens 4. Nutlets hemispheric, edges fringed.

This genus differs from Hyptis principally in having boat-shaped nutlets with fringed edges. Marsypianthes resembles Hyptis and differs from Stachys and Lepechinia in having middle lobe of lower lip of corolla saccate.

1. Marsypianthes chamaedrys (Vahl) Kuntze, Rev. Gen. 524.

1891. Branches sprawling, 15-50 cm long, densely viscid villous. Calyx-teeth sharp-pointed. Corolla about equaling calyx. Illustr., Fl. Panama 56:98. 1969.

Mexico, British Honduras to Salvador and Panama, W. I., S. A. Honduras (FLAS).

Nicaragua:

Zelaya, Comarca del Cabo, Puente Pozo Azul. Seymour 4601 (SEYM); Seymour & Robbins 5821 (BM, ENAG, FLAS, GH, MO, NY, SEYM, SMU, UC).

Nueva Segovia, Plan Grande. Seymour 5148 (ENAG, MO, SEYM, SMU).

Managua, Managua. Garnier A1383 (GH).

19. COLEUS Loureiro

Herbs or shrubs. Leaves toothed, on petioles. Flowers in terminal spike-like racemes. Calyx 5-toothed. Corolla 2-lipped, mostly blue or lilac. Stamens 4. Nutlets ovoid or suborbicular, smooth.

- A. Flowers on pedicels; pedicels 1.5-2.5 mm long; blades dentate or incised 1. Coleus blumei Bth.
A. Flowers almost sessile; blades crenate, pilose-tomentose beneath 2. Coleus aromaticus Bth.

1. Coleus blumei Bth., Labiat. 56. 1832.

Herb. Peduncles short. Leaves ovate.

Florida (FLAS), Guatemala, Costa Rica, Puerto Rico (FLAS). Jamaica (FLAS), East Indies; native of tropical Asia.

Nicaragua:

Zelaya, Nueva Guinea. Atwood & Nelson 5366 (BM, ENAG, FLAS, GH, MO, NY, SEYM, SMU, UC).

Jinotega, Bocaycito. Atwood, Marshall & Neill 6917 (FLAS, GH, MO, SEYM, SMU).

2. Coleus aromaticus Bth., Wall. Pl. As. Rar. ii: 16.

Coleus amboinicus Loureiro, Fl. Cochinch. ii: 372.

Reported in Costa Rica, Fl. C. R. 1015, 1938.

20. OCIMUM Linnaeus Basil

Herbs or slightly woody. Leaves usually on long petioles. Inflorescence of terminal racemes or panicles. Flowers in clusters. Calyx 2-lipped, margins of upper lip decurrent on tube, lower lip 4-toothed. Corolla 2-lipped. Stamens 4, declined. Nutlets obovate or spherical, rough or smooth.

A. Calyx in fruit 7-9 mm long, decurrent margins of upper calyx-lip extending to base . . . 1. Ocimum micranthum Willd.

A. Calyx in fruit less than 6 mm long or 5-7 mm long B.

B. Stems pilose 2. Ocimum americanum L.

B. Stem glabrous below or puberulent and softly hairy on young stems C.

C. Pedicels almost obsolete; calyx in fruit 5 mm long; corolla 2.5 mm long; fruiting calyx long-ciliate, reflexed 4. Ocimum basilicum L.

C. Pedicels 1-2 mm long; calyx 3-4 mm long; corolla 4-5 mm long 3. Ocimum gratissimum L.

1. Ocimum micranthum Willd., Enum. Pl. 630. 1809.

Illustr., Fl. Panama 56:104. 1969.

Florida (FLAS), British Virgin Is. (FLAS), Jamaica (FLAS), Puerto Rico (FLAS). Mexico, British Honduras to Salvador and Panama, W. I., S. A., Fl. Guatemala 9:269. 1973.

Nicaragua:

Zelaya, Comarca del Cabo, Bihmona. Seymour 5741 (MO, SEYM).

Nueva Guinea. Seymour 5391 (VT).

Nueva Segovia, Ocotal. Seymour 864 (MO, SEYM).

Esteli, Condega. Mark 6332 (BM, DUKE, F, FLAS, GH, MICH, MO, MSC, NY, REED, SEYM, SMU, UC).

Matagalpa, Calabazas. Seymour 2597 (VT).

Carazo, Santa Teresa. Nichols 1316 (BM, SEYM, SMU).

Rio San Juan, San Bartolo. Seymour 6190 (VT).

2. Ocimum americanum L., Amoen. Acad. 4: 276. 1759.

Matagalpa, Tuma. Seymour 4052 (SEYM).

3. Ocimum gratissimum L., Sp. Pl. 1197. 1753.

Florida (FLAS), tropics of America and Africa, Ceylon,

Java, East Indies.

4. Ocimum basilicum L., Mant. i:35. 1767.

Cultivated in tropical America; native in tropical Asia.

21. CATOPHERIA Benth

Herbs or shrubs. Leaves dentate. Petioles long. Flowers in very dense spike, sessile, reflexed. Peduncle long. Bracts shorter than calyx. Calyx 2-lipped, one lip ovate, the other entire or 4-toothed. Corolla 2-lipped, one lip narrow, entire, the other wide, 4-toothed. Stamens 4, much exerted. Nutlets subspherical, smooth.

A. Blades up to 5 cm wide, attenuate at base; calyx 12 mm long; corolla 2.5 cm long 1. Catopheria capitata Hemsley

A. Blades 7-11 cm wide, rounded or subcordate at base; calyx 7 mm long at flowering time, much longer in fruit
 2. Catopheria chiapensis Bth.

1. Catopheria capitata Bth. ex Hemsley, Biol. Cent. Amer. Bot. 2:541. 1882. British Honduras.

2. Catopheria chiapensis Gray ex Bth. in Hook. Icon. 13:14. 1877. Illustr., Fl. Guatemala 9:240. 1973.

Mexico, Guatemala, Salvador, Honduras, Fl. Guatemala 9: 239. 1973.

ABBREVIATIONS

Bth., Benth

C. & S., Chamisso & Schlechtendal

Illustr., illustration or illustrated

R. & S., Roemer & Schultes

S. A., South America

SEYM, Herbarium of Frank C. Seymour

UCA, Herbarium of Universidad Centroamericana, Managua, Nicaragua

WDP, Herbarium of St. Norbert College, West De Pere, Wis.

W. I., West Indies

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Standley, P. C. & L. O. Williams. Flora of Guatemala: Labiatae, Fieldiana, Bot. 24: part 9:237-317. 1973.

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BOOK REVIEWS

Alma L. Moldenke

"ARID ZONE IRRIGATION" edited by B. Yaron, E. Danfors & Y. Vaadia, x & 434 pp., 181 b/w fig. Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1973. \$36.20.

This comprehensive, importantly useful book is issued as "Ecological Studies 5" and consists of 29 papers by 26 authors including the editors who are mostly Israeli scientists. It is planned for advanced student and professional "agronomists, soil scientists, agrometeorologists, water engineers and plant physiologists who want a clear presentation of irrigation fundamentals in arid and semi-arid zones.....To overcome the problem of water shortage in arid zone agriculture" for each of the important crops grown, the importance of closed systems, use only at precritical stages, and present and future adjustments for decreasing salinity is carefully explained.

It is amazing how much high quality advice based upon scientific research is immediately available to all crop growers in Israel and indirectly to all others in similar near-desert conditions.

"GENETICS OF FOREST ECOSYSTEMS" by Klaus Stern & Laurence Roche, x & 330 pp., 70 b/w fig., Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1974. \$29.00.

This fine study is presented as "Ecological Studies 6" which introduces by content and bibliography much valuable material that has typically been limited to forestry journals. In this present series it should have a larger and wider range of appreciative readers.

The scope includes our few remaining natural forest ecosystems, those under varying degrees of management as well as man-made ones in humid tropics and subtropics, in the subarctic and in temperate zones with regard to (1) characteristics of ecological niches (à la Hutchinson) of forest tree species, (2) adaptations in the vegetative and reproductive cycles, (3) characteristics of genetic systems, (4) adaptive strategies, (5) coevolution of competing species of trees and their pollinators and seed/fruit dispersers, as well as host-parasite systems, and (6) effects of man on forest ecosystems through his hunting, grazing, agriculture, modern forestry, etc.

"PERSPECTIVES OF BIOPHYSICAL ECOLOGY" edited by David M. Gates & Rudolf B. Schmerl, xiii & 609 pp., 223 b/w fig. & 66 b/w tab. Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1975. \$59.50.

This careful study comprises "Ecological Studies 12" with its 36 fine papers by 47 authors as well as D. Gates' prefatory feature and introductions to the 6 sections of the symposium held at the University of Michigan Biological Station at Douglas Lake in August of 1973. They cover the researches for the past 15 years of his advanced students on (1) analytical models of plants - photosynthetic and respiratory, (2) plant productivity under extreme climates - gas exchanges, (3) water transport, (4) theoretical models of animals by heat transfer analyses, (5) animal body temperature rates and (6) energy-transfer studies of animals. Of course, this ecological orientation "uses fundamental principles of physics and chemistry along with mathematics...a mechanistic approach..... amenable to theoretical modeling [which] must always have recourse to experiment in the laboratory and observation in the field."

This volume, like No. 7 on "Mediterranean Type Ecosystems", does not have the irritating misprints that show up in Nos. 5 and 6 for lack of some simple proof-reading.

"MAN AND NATURE — Every Living Thing" by Malcolm Ross-Macdonald & Robert Allen

"WORLDS APART — Nature in Cities and Islands" by John Sparks & John Andrew Burton

"FRONTIERS OF LIFE — Animals of Mountains and Poles" by Joseph Lucas, Susan Hayes & Bernard Stonehouse

"THE WEB OF LIFE — The Ecology of Earth" by John Oates, Derek Toomer & Alan Cane.

"GREEN WORLDS — Plants and Forest Life" by David Bellamy & Michael Boorer.

"THE LIVING WATERS — Life in Lakes, Rivers and Seas" by Gillian Standring & Peter Credland

"EARTH IN DANGER — Pollution and Conservation" by Ian Breach & Michael Crawford

"LIFE IN THE FUTURE — Prospects for Man and Nature" by Malcolm Ross-Macdonald, Michael Hassell & Stuart McNeill

"PLANET EARTH — Earth's Atmosphere and Crust" by John Sparks & Arthur Bourne

"DESERTS AND GRASSLANDS — The World's Open Spaces" by John Cloudsley-Thompson & Eric Duffey

Doubleday and Company, Inc., of Garden City, New York, has produced this attractive nature series by some metamorphoses of its previous printings, by condensing, recombinations, and different relevant titles. Each of these ten books consists of two 144-page parts with its own indexing and picture credits. Each part

has about 130 color photos that vary from fair to excellent in reproduction quality. The first book of the series was published in 1975, the rest in 1976. Each is priced at \$14.95 and is provided with an orienting foreword by David Attenborough.

Individually or as a set this material attractively and accurately presents many facets of nature for general readers, for visitors to the respective areas discussed and for students of grade and secondary school level.

"THE WORLD'S WORST WEEDS — Distribution and Biology" by LeRoy G. Holm, Donald L. Plucknett, Juan V. Pancho and James P. Herberger, xii & 609 pp., 220 fig., The University Press of Hawaii, Honolulu, Hawaii 96822. 1978. \$35.00.

This book, funded by the East-West Center, should prove to be very valuable the world around because of its "inventory of the principal weeds of the world's major crops", with particular emphasis on their description with excellent drawings, distribution data with effective world maps, seriousness with crop maps, known biology with means of propagation and pests carried, and common names used in the areas most affected. The first part of this study treats in order of harm done the eighteen most serious ones starting with Cyperus rotundus L. as the "awfullest awful". They are mostly sedges, grasses and chenopods. The next part considers similarly and alphabetically 58 more of these highly adaptive plant invaders. The third part of the book considers our 16 most important crops, their cultural requirements and the majority of the weeds affecting them.

Appendix material provides a "World List of Useful Publications on Weed Distribution, Identification, Biology and Control", publications dealing with poisonous plants and a glossary.

"A HANDBOOK OF FIELD AND HERBARIUM METHODS" by S. K. Jain & R. R. Rao, xvi & 157 pp., 31 fig. & tab. Today and Tomorrow Printers and Publishers, New Delhi - 110005, India. 1977. Rs. 35.00 paperbound.

This is a well planned text for courses in field botany or for individual study as is indicated by the following chapter headings: (1) need for plant exploration, (2) herbaria, (3) botanical gardens, (4) practical collecting, (5) herbarium methods, (6) taxonomic literature, (7) phytogeographic plant descriptions and notations, (8) botanical keys, (9) botanical nomenclature and type concept, (10) publication of botanical studies, (11) abbreviations used and (12) centers of taxonomic work in India, especially for the important Botanical Survey of India.

The paper used in the production of this book is certainly not long-lasting.

"ATLAS OF UNITED STATES TREES Volume 4 Minor Eastern Hardwoods"
by Elbert L. Little Jr., v & 20 pp., 170 maps. Miscellaneous
Publication 1342, U. S. Department of Agriculture, Forest
Service. U. S. Government Printing Office, Washington, D.C.
20402. 1977. \$8.75 oversize.

"Volume 4, Minor Eastern Hardwoods", with 166 species not in previous volumes, aims to complete these maps of the tree species native in eastern contiguous United States, except the tropical trees of southern Florida and the perplexing group of hawthorns. The maps are carefully prepared from all available botanical data and are arranged alphabetically according to scientific name. Occurrence beyond the map area is designated where it applies. Only native and thoroughly naturalized tree species are included. Twenty-five of the species treated have relatively small range in the United States. "One of these is classed as extinct except in cultivation, 3 are classed as endangered, and 9 are designated threatened".

This volume is prepared with the usual expertise and thorough work patterns of the author Little. Its price is fantastically low.

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